TECHNOLOGY DEPARTMENT

JUNE, 1948

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Plant Engineering

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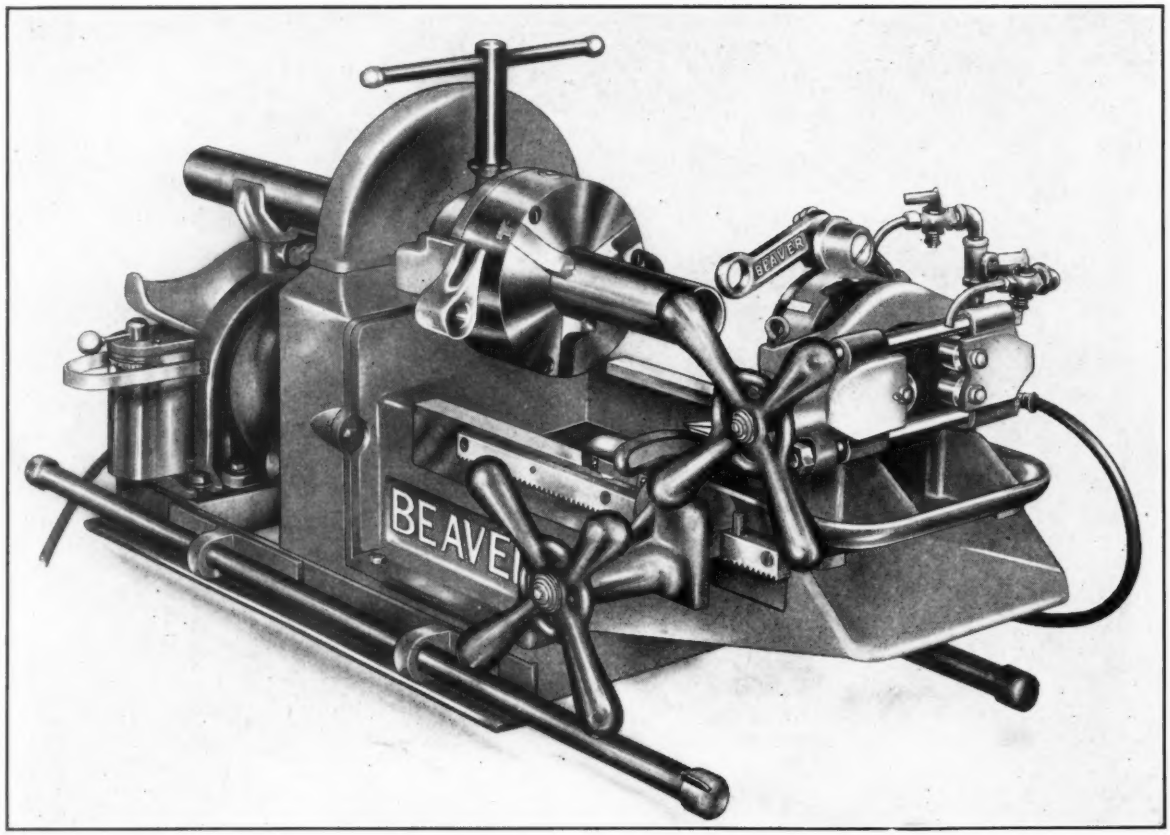
Volume 2, No. 6

The magazine that helps plant engineers with their everyday problems



BEAVER MODEL-A
Heavy Duty Pipe & Bolt Machine!

● RIGHT-HANDED. *Conforming to standard machine tool design,* with chuck to the left and the controls to the right of the operator like a lathe—*for right hand operation.*

● ALL CONTROLS IN FRONT. —at the operator's finger tips.

● 50% GREATER WORKING SPACE. 12 inches between chuck jaws and die-head (when fully extended). Other leading competitive machines have but 8 inches.

● POWER IN ABUNDANCE. Cut and thread 2½ to 12-inch-pipe with geared tools and drive shaft. Motor develops 2.3 hp.

● FULL RANGE — ⅛ to 2-inch.

● UNIVERSAL MOTOR. Standard equipment is a heavy-duty Universal motor to operate on any 110 volt electric light line, AC or DC, 25 to 60 cycle, 220 volt Universal motor optional at same price. Other motors are available—full information upon request.

● CUTOFF. Ball bearing, self-centering, wheel and roller cut-off for pipe and bolts standard equipment . . . knife cutoff (for pipe only) optional at same price.

● STANDARD CHUCK. *An all-steel 3-jaw universal chuck of standard make* is used. Capacity—⅛ to 2-inch.

● AUTOMATIC CHUCK WRENCH EJECTOR. An important safety feature!

● GEAR DRIVEN. *All gear driven—positive power!*

● BOLTS up to 7⅛-inch can be cut off with the wheel-and-roller cutoff. Threads solid rounds up to 2-inch.

● ADJUSTABLE OPENING DIEHEADS are solid ring type —*no "hinge" to become fouled with fine chips. All four die segments move as a unit—insuring uniform adjustment and even distribution of cutting on all four segments.* Fully adjustable for standard, oversize or undersize—*no tools required for adjustment.*

● INTERCHANGEABLE DIE SEGMENTS. *Any individual segment may be replaced without buying a complete set.*

● REAMING. A multi-fluted, ⅛ to 2-inch, cone reamer swings in and out of working position.

● OIL PUMP—ACCESSIBLY LOCATED. The impeller blade type oil pump is on the outside—*you can get at it for occasional cleaning without tearing the machine apart.* Oil pump is reversible. No check valves. Concealed oil lines—will not get knocked off. Double jet oil flow.

● STANDARD BASE-MOUNTING MOTOR. Connected by means of flexible coupling to helical all-gear drive.

● REVERSIBLE. At the controller type switch. *Motor and switch heavily guarded to protect them from damage.*

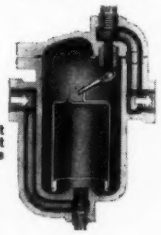
● RACK - AND - PINION FEED. Inverted rack-and-pinion (protected against chips because inverted) operated by large handy starwheel *from the front of the machine—by operator's right hand. Hand wheel and carriage, due to idler gear, move in the same direction.*

Write for complete catalog No. 48

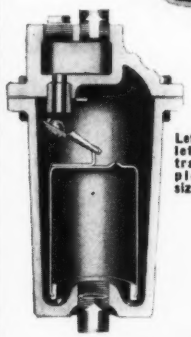
BEAVER PIPE TOOLS

210 DANA AVENUE *Quality Tools—Since 1900* **WARREN, OHIO**

CHOICE OF BODY STYLES

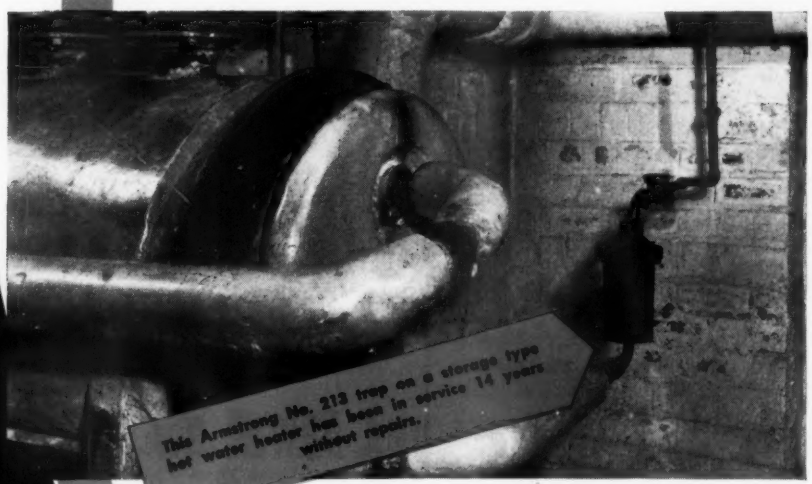


Right: Side Inlet — Side Outlet traps for in-line installation.



Left: Bottom Inlet — Top Outlet traps in a complete range of sizes.

WHY ARMSTRONG TRAP MECHANISMS *last so long!*



This Armstrong No. 213 trap on a storage type hot water heater has been in service 14 years without repairs.

WHAT USERS SAY

36 Armstrong Traps on heating system service in an Atlanta building still going strong without maintenance after 10 years.

* * *

One minor repair job in 20 years —that's the record of the Armstrong traps in service at South Dakota hospital.

* * *

Standardization on Armstrong traps slashed maintenance—first trap operating over 15 years without repairs—Canadian foundry.

SEND FOR the Armstrong Steam Trap Book—36 pages on trap selection, installation and maintenance. Free on request.

...They're built to stand 1500 psi, 1000°F

The user of standard Armstrong steam traps for medium and low pressure service reaps the benefit of the research, investment and experience that went into the development of Armstrong forged steel traps for high pressure generating station service.

The valves and seats in all Armstrong traps are chrome steel, hardened, ground and lapped to a precision fit. The inverted buckets and valve lever assemblies are all corrosion resistant 18-8 stainless, heavily reinforced for wear. In normal service these mechanisms often last for years without attention. And when a valve finally wears to the point where it fails to seat properly, it is usually good for a relapping—a job any maintenance man can do in a few minutes. Or replacement is a simple, inexpensive job.

It's this built-in quality of Armstrong traps that keeps them on the job without leaking steam, without sticking or clogging, without frequent maintenance. Quality pays dividends when it comes to steam traps. Plan now to standardize on Armstrong, the *quality* traps. Call your Armstrong representative or write:

ARMSTRONG MACHINE WORKS

912 Maple St., Three Rivers, Michigan

ARMSTRONG FLOATING BUCKET STEAM TRAP

ARMSTRONG STEAM TRAPS

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Letters from the Readers

This section is for open discussion of: any topic of interest to, or, in the sphere of the plant engineer; pertinent comment on articles published; and suggestions, criticism or commendation. Let the quips fall where they may. Material selected for publication wil be paid for and, upon request, name and company conection will be omitted.

Floor Loads

ATTACHED is a copy of the bulletin sent out to all our foremen throughout the corporation. As a result of this activity considerable interest has been shown by our foremen. The engineering department reports that they have been swamped with requests for advice about the maximum floor loads in various departments.

Two cases have been brought to my attention where floors were dangerously overloaded. It is needless to say that I eagerly await each issue of PLANT ENGINEERING since this fine article appeared in December. The cuts of the pictures which you sent us will be returned immediately. Thanks again for your cooperation.

G. H. BURKHARDT,
Safety Director
The General Tire & Rubber Co.

The article which Mr. Burkhardt refers to is "Watch Those Floor Loads," by William W. Gaylord (PLANT ENGINEERING, December, 1947, page 26). Mr. Burkhardt reprinted the article in the form of a safety bulletin which was distributed to all of General Tire and Rubber Co.'s foremen. Another excellent article on floor loading also written by Mr. Gaylord appears in this issue. It is titled "How To Keep Floor Loads Within Safe Limits." Editor.

Observe Safety Rules

BEING an old time accident reviewer, the writer has followed with interest your "Safety Crimes" page. The similarity that is found in the accident that happens today when compared with the accident that happened yesterday or last year, makes it apparent that more workers should realize that what happened last year to others could happen this year to them.

It is interesting to note that after four years of hard fighting, the casualties of World War II included 259,637 killed, 651,934 wounded, and 35,329 missing, while in one year in the United States there are more than 100,000 killed and 10,000,000 injured from accidents alone

When statisticians analyze the factors involved in thousands of accidents, two facts always stand out. One is that the workers usually have no one but themselves to blame for the accidents, and two, the accident could have been prevented if the employee had observed established safety rules.

Chicago, Ill. C. J. R.

Warmly Received

I WOULD GREATLY appreciate your sending me a copy of the November issue of PLANT ENGINEERING. I am very much interested in an article on "Duties of a Plant Engineer."

Upon receiving my first copy of your magazine I sent it through to our plant engineering personnel and it somehow got lost. I want to congratulate you on this magazine and think you might be interested in knowing that it was warmly received in our plant. I shall look forward to future issues.

F. J. VAN VOORHIS
Plant Engineer,
Owens-Corning Fiberglas Corp.

On Sanitation

THE FOLLOWING is among many letters received by Jos. E. Seagram & Sons, Inc., following publication of an article in PLANT ENGINEERING concerning the Seagram sanitation plan.

"I have just read with extreme interest your article on sanitation in the January, 1948 issue of PLANT ENGINEERING. It certainly looks as if your company has done a real job on the difficult problem of industrial sanitation.

"We would very much appreciate receiving copies of your 'Sanitation News Letter' and any other information such as your 'Standard Cleaning Methods'."

F. W. H., Chief Plant Engineer

Worth a Lot

I AM IN receipt of a copy of your December, 1947 issue in which a very interesting article entitled "Solving Problems in Vibration Control" has struck home. Please advise the names of manufacturers of vibration control equipment.

Under separate cover I am requesting that you forward additional issues of PLANT ENGINEERING as they become available. This magazine is worth a lot to me.

W. L. MAXSON
Hoffman Radio Corp.

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Compact

Portable

Lightweight

FOR TESTING A-C POWER AND LIGHTING CIRCUITS

FIVE* Instruments in *ONE

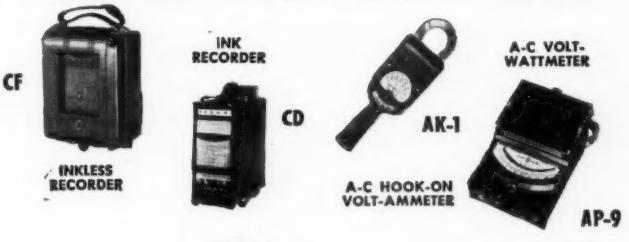
1. Amperes (0-2.5/5)
2. Volts (0-150/300/600)
3. Watts
4. Vars
5. Power Factor

Use for load surveys, induction motor tests, reactive-power studies, and power-factor improvement programs—with the aid of conventional instrument transformers to extend the range, and with the calculator provided.

This new A-c Load Visualizer embodies an advanced principle of instrument design brought forth by the General Electric Company to meet the need in industry for a small lightweight analyzer with a few simple convenient connections, and all readings made on a single dial.

This versatile instrument comes housed in a sturdy, greaseproof, black Textolite case with a detachable leather carrying strap. Along with it you also get a complete instruction card, calculator, and flexible voltage leads as shown above. Total weight is only five pounds. For more complete information of operating principle and procedure and further specifications write for bulletin GEA-4784. *Apparatus Department, General Electric Company, Schenectady 5, N. Y.*

OTHER GENERAL ELECTRIC TESTING INSTRUMENTS—



GENERAL ELECTRIC

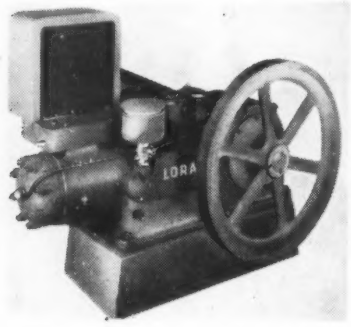
802-125

New Products and Methods

What's New? American industrial superiority is based upon doing things easier, faster and better. Here industrial ingenuity is summarized for your quick review. If you want additional information, have questions on specific applications, use the no obligation, no postage, "Mark, Clip and Mail" postcard between pages 10, 11 and 42, 43.

1 Cyl. Multi-Fuel Engine

1 This new Type O single cylinder, horizontal, two cycle multi-fuel engine is rated at 34.3 hp at 450 rpm. It has a 9½ in. bore and 10 in. stroke with Timken bearings on crankshaft and crosshaft. Wet-sleeve type cylinder liners are of alloy cast iron, eliminating costly reboring and shutdown time. The engine may be operated as a cold starting, full Diesel or converted to burn

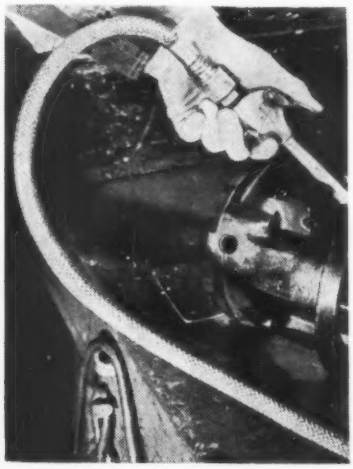


natural gas or butane as fuel. Condenser type cooling system eliminates need for water pump and makeup water is negligible. Standard equipment includes Twin Disc clutch, Pierce governor, Air Maze oil bath type cleaner, McCord lubricator. Dimensions are: height 59 in., length 88 in., width 58 in. Shipping weight is 3800 lbs. White-Roth Machine Corp.

Flexible Tubing

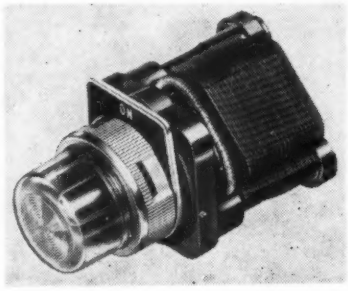
2 Dependability and life have been greatly extended in the flexible tubing field as the result of new Buna and Neoprene base synthetics which stand up under the terrific punishment of high temperatures, pressures, vibration, internal and external corrosive solvents and fumes. Not only is useful life increased many times, but leakage and maintenance troubles are eliminated. Although constantly soaked by process oil, grease and grime, tests indicate that this wire-braid tubing has already served four times as long as those previously used and shows no sign of failure. ¼ in. tubing will stand burst pressures to 1000 psi and larger sizes proportionately less. Installations for temperatures to 300 F are possible.

Standard sizes from ¼ to 2 in. ID and in a complete range of lengths up to 200 ft in the small diameter and 50 ft in the largest diameters are supplied. Ronaflex Tubing Co., Inc.



Oil-Tight Pilot Light

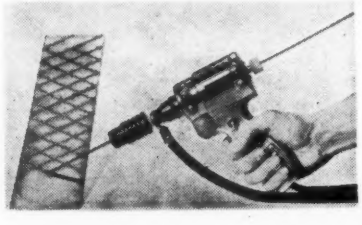
3 This new pilot light has been designed for machine tool applications where cutting oils and coolants may cause an ordinary, general purpose type of pilot lamp to become inoperative. It is designed for panel mounting through a hole 1$\frac{7}{32}$ in. in diameter. Construction permits mounting on panels as thin as $\frac{1}{16}$ in. or as thick as ¼ in. Color caps are available in clear, white, red, amber, green and blue colors and are designed for wide angle visibility. The ac



version of the new light has a built-in transformer permitting the use of a 6 v, incandescent lamp with a miniature, bayonet-type base. The 6 v lamp filament is strong enough to withstand shock or vibration which frequently cause failure of higher voltage filaments. The bayonet-type socket prevents the lamp from loosening under severe conditions of shock or vibration. The version designed for use on dc employs a 110 v candelabra screw base neon lamp. Series resistors are used for voltages exceeding 110 v. Square D Co.

Tread-Making Tool

4 This tool is said to provide a simple low cost method of preventing slipping and falling accidents on smooth steel or iron surfaces. It is a vibrating electrode holder used with either a c or d c welding machines to deposit hard rough bead lines about ⅛ in. wide and $\frac{1}{16}$ in. high. In operation, the end of the electrode is placed in contact with the surface to be roughened and drawn along at approximately 5 fpm. It is not necessary to hold an arc, as in welding, since the vibrator causes intermittent arcing, which melts the end of the hard steel electrode and fuses the molten droplets to the base. The deposited metal is extremely hard and retains its slip-proof qualities, even when wet or oily. Metallizing Engineering Co., Inc.



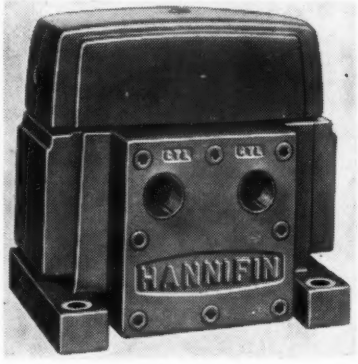
Finish for Insulation

5 A new finish for insulation designed for use on low-pressure steam lines and hot water heating lines at temperatures not exceeding 300 F is white finish pre-shrunk Asbestocel. The white finish stays sparkling white. It resists staining and cleans easily, mak-

ing it ideal for covering pipe lines that are exposed to view, whether in the office or factory. If desired, it can be painted without sizing, to match any color scheme. Its glazed white finish is applied directly to a 100 per cent asbestos covering. Underwriters approved. Johns-Manville Corp.

Fast-Cycling Air Valve

6 A new electrically operated 4-way valve for directional control of the flow of compressed air is announced. Designed primarily to provide a fast-acting push button control for small, air operated presses and similar



units, the valve is a packless reciprocating disc type, pilot operated and solenoid controlled. The piston is aluminum and the disc is hardened stainless steel. It is built in two types: Type I is arranged for double solenoid operation using two push buttons or limit switches. Valve position is determined by energizing the proper solenoid. Type II is arranged for power offset operation using a single push button or

Here is the CMH contribution to maximum expansion joint life

CMH Controlled-Flexing Expansion Joint
CMH Free-Flexing Expansion Joint
CMH Expansion Joints are Flexonically* engineered to minimize internal stresses and to uniformly distribute working stresses

The corrugations of CMH Expansion Joints are scientifically formed by advanced methods developed through years of experience. Advanced forming methods coupled with carefully controlled heat treating minimize the internal stresses normally developed in fabrication. Working stresses are held in balance by FLEXONICALLY* engineered curvature of corrugations to best distribute the forces resultant in service.

These remarkable design features make possible completely dependable expansion and misalignment control in a compact unit with no maintenance or other service attention.

CMH CONTROLLED-FLEXING EXPANSION JOINTS

Sizes 4" to 24" Inside Diameters. For Pressures up to 300 p.s.i. Temperatures to 900°F. Copper or Stainless Steel Pressure Carriers. Traverse from 5/16" to 6-3/4". Flanged or Welding Ends. Control Rings Corrugation-mated to close working tolerances.

CMH FREE-FLEXING EXPANSION JOINTS

Sizes 4" to 24" Inside Diameters. For Pressures up to 30 p.s.i. Temperatures to 900°F. Copper or Stainless Steel Pressure Carriers. Flanged or Welding Ends.

Get full details today. Write for the new CMH Expansion Joint Bulletin EJ-47.

"FLEXON" identifies CMH products, which have served industry for more than 45 years.

*the science of FLEXONICS..."the controlled bending of thin metals for use under varying conditions of temperature, pressure, vibration and corrosion"...is exemplified in the basic products of Chicago Metal Hose Corporation.

CMH EXPANSION JOINTS

CHICAGO METAL HOSE CORPORATION

Expansion Joint Division • Maywood, Illinois

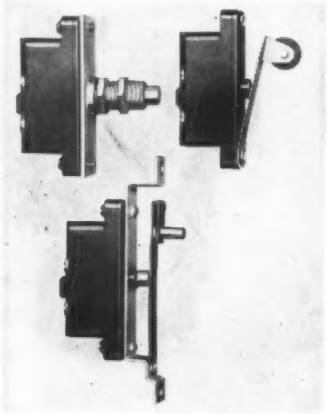
Plants at Maywood, Elgin and Rock Falls, Illinois

New Products and Methods

limit switch. The valve returns to its initial position when the solenoid is deenergized. Either type is capable of as many as 180, or more, operating cycles per minute in handling any air pressure from a minimum of 25 psi to a maximum of 150 psi. Type I units are rated at 10 watts, Type II units at 20 watts. Standard models are built for 115 v, 50-60 cycle circuits. Hannifin Corp.

New Operators for Switch

7 The new series of three operators can be added to the basic mechanism of the precision snap switch to extend its industrial applications. The new operators are provided in the following arrangements: A. Plunger-type, panel-mounting switches consisting of the basic snap switch mechanism in combination with a plunger-type operator. The plunger mechanism consists of a plated brass tube containing an operating button



and an over-travel spring. B. Roller-leaf limit switches consisting of the basic contact mechanism riveted to an operating arm of beryllium copper. At the end of the arm is a non-metallic roller assembly, suitable for operation from a cam or other means. C. Door-type switches designed to function as an electrical interlock on a cabinet door. These arrangements consist of the basic contact mechanism assembled to a mounting bracket and a beryllium copper operating arm. Square D Co., Industrial Controller Div.

Process Control Timer

8 Announced is the latest type time-schedule controller. The company claims this timer is most practical, and can be synchronized with any system of air-operated semi-automatic temperature and pressure con-

trol now in use. In use, the operator begins the process by pressing the starter push button on the timer. A signal light above the button flashes on to indicate the process is under way. By means of an adjustable cam, timing begins immediately, or, if desired, when the temperature has reached the processing point. This temperature is maintained for the predetermined length of time. All valves—steam, air, drain, overflow and cooling water—are operated as the process may require and all manual adjustments heretofore performed by the operator are eliminated. At the completion of the process and the cooling period, the signal light is extinguished, indicating visibly that the process cycle has been completed. C. J. Tagliabue Corp.

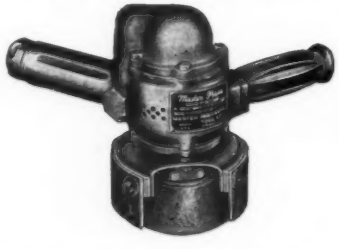
Reinforced Unions

9 OK-tag-on-all (octagonal) unions and union fittings are ruggedly designed with eight reinforcing ribs for 300 lb wp of saturated steam at 550 F, and up to 600 lb non-shock pressures

for cold water, gas, gasoline, air, oil, etc. They are made of superior air-refined malleable iron and with virgin bronze seats. Joints are ground to masters for perfect, leak-proof fit. All unions are carefully inspected, individually tested with 150 lb air pressure and guaranteed leak-proof under severe working conditions. All parts are interchangeable. Unions are made with bronze to iron seats, bronze to bronze seats. Iron to iron seats are available for use when element piped effects bronze adversely. The Corley Co., Inc.

Portable Vertical Grinder

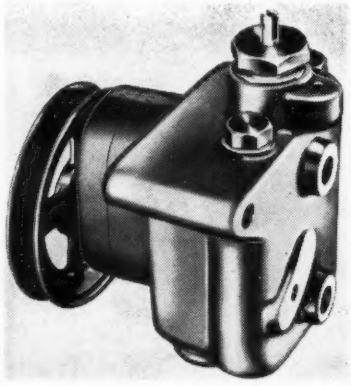
10 A light weight pneumatic vertical type grinder, sander and wire brushing tool, called the Master Model M-401, is now available in speeds of 6000 rpm and 8000 rpm free



speed. It performs a variety of metal removing jobs in foundries and other metal finishing plants. Features embodied in this tool are: Industrial hard chrome on important wearing parts. Weighs only 7 lb. Positive governor control assures safety with positive "off and on" throttle control. Master Pneumatic Tool Co., Inc.

Hydraulic Power Unit

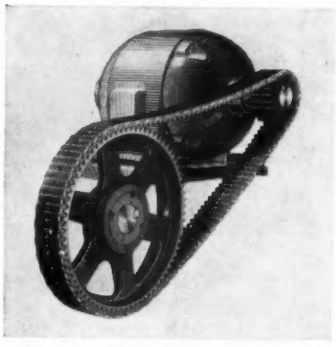
11 A midget size hydraulic unit that serves industrial, plant maintenance, service repair, and road machinery can easily be put to use on such applications as arbor presses, hydraulic clamping vises, forming, straightening, and bending devices, light material handling units, small balers, pressure inserting equipment, railway maintenance operations. Dimensions are 6 by 7 by 9 in. overall. It has a capacity of 3 gpm of oil at 1200 rpm at 1000 psi or 4½ gpm at 1800 rpm at 1000 psi. It requires approximately 2½ hp to operate at 1200 rpm. The unit consists of a Hydro-Power developed gear pump with hardened and ground gears running in bronze bearings for smooth and quiet operation; a valve housing protects the check valves that eliminate mo-



mentary drop of ram while ram is being shifted, and the four-way control valve permits the use of a double acting cylinder that is hydraulically actuated in both directions. The Hydraulic Press Mfg. Co.

Silent Chain Drives

12 This new industrial standard stock-drive silent chain is now available in middle-guide type in two pitch sizes: ½ in. (SC-4) in widths of ¾, 1, 1½, 2, 2½, 3, and 3½ in ¾ in. (SC-6) in widths of 2, 3, 4, 5 in. Features are taper-lock bushings, tapered for easy as-



sembly into taper-bored sprocket hub, tight fit on shaft, and easy removel. No reboring is necessary. Made of gray iron having a high steel content, and all steel pinions with hardened teeth, and 1⅛ in. long hub on one side. Carried in stock with finished bores for standard N.E.M.A. frame motor shaft diameters, complete with keyway and set-screw. Link-Belt Co.

Hard, Dry Rustproof Coating

13 Rustproof is applied cold by dipping, spraying or brushing and dries in about 15 minutes to a clear, hard, dry surface. It is reported to be tough and flexible and non-porous, and has the capacity of creeping under and displacing moisture, finger prints, etc.

It may be removed with any petroleum solvent although it is not necessary to remove it prior to painting. The fact that it is clear, hard and dry permits handling. According to reports, Rustproof offers protection under ordinary indoor conditions for periods up to 6 months and more. Available in packages from one gallon to 55 gallons. Kano Laboratories.

Do you want more information on this equipment and its application? Use the no obligation, no postage card between 10 and 11, 42 and 43

"The Battery For Today!"
WORTHINGTON
One of many plants using Worthington multiple compressor installations in the processing of gases

THAT KEEPS AIR-COSTS FROM PILING UP A SCORE

The more compressed air or gas you use, the more you can economize with Worthington Opposed Steam Driven Compressors With over 50 years of development behind them, these rugged, tireless performers are up-to-the-minute in every last cost-saving detail. For example:

Pressure feed lubricates each side independently, reducing outage and maintenance to a minimum . . . full accessibility to all steam and air cylinder interiors by removal of rear cylinder heads only . modern, trouble-free bearings for uninterrupted service . . . and Worthington Feather* Valves, most efficient ever made.

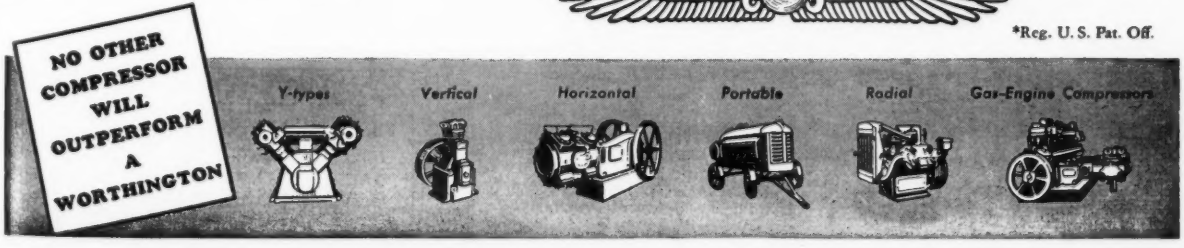
Reduced Labor and Maintenance Costs

Following the Worthington formula, these modern Compressors combine high performance efficiency with minimum maintenance requirements. Their ability to do a better job, year after year, on amazingly low operating costs is familiar proof that *there's more worth in Worthington.*

Write for Bulletin L-680-B1A. *Worthington Pump and Machinery Corporation, Compressor Division, Buffalo, New York.* W3.7

WORTHINGTON

*Reg. U. S. Pat. Off.



New Products and Methods

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Expanding Screw Anchors

14 Plastic expanding screw anchors are now available in handy, complete assortment kits. These kits assure the workman of having the proper size anchor for every job.

Available in two sizes, 250 to 325 assorted anchors for wood screws Nos. 5 through 20 and ¼ and ⅜ in. lag screws. Each assortment is packed in a sectional, custom-molded plastic case. These expanding screw anchors are guaranteed for use in any material such as concrete, brick, tile, plaster, plasterboard, glass and many other surfaces. Holub Industries, Inc.

Silent Chain Stock Drives

15 Announced is an entirely new series of silent chain stock drives for the ½ and ¾ in. pitch chain sizes. The line will cover both sprockets and chains. Cast-iron stock sizes of driven sprockets will have finished bores prepared for use with taperlock bushings. This is expected to reduce installation and replacement time. Bushings will be available with finished bore diameters in increments of ⅛ in. Driving sprockets will be furnished with finished bore diameters in the N.E.M.A. standard shaft sizes, complete with keyway. In addition to features such as the silent chain rocker joint, all popular widths of chain will carry a single center guide link. Six dual-duty sprocket face widths will operate with eleven stock chain widths. This makes it possible to obtain as many as forty ratios for each stock chain width. Morse Chain Co.

Lubricator and Filter

16 A new Lubri-Filter, combining a lubricator and filter, designed for compressed air lines, has been announced. The unit protects air-driven equipment against dry-running breakdowns and impurities in the air supply. Air is cleaned automatically by a permanent type, cleanable filter element which is said to require no replacement. Atomized oil is automatically injected into the air line in proper amounts. Oil level can be seen from any angle. Model 605 Lubri-Filter is precision-built of aluminum and brass, and provides an unrestricted air flow of ¼ in. I.P.T. Price $5.75. Jarrett Compressor & Equipment, Inc.

4-in-1 Megohmer

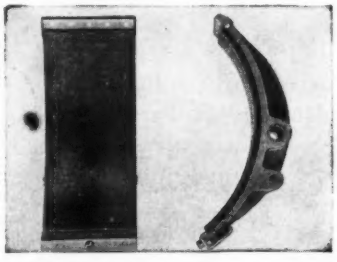
17 A new Megohmer insulation tester, the Model B-6, is called a 4 in 1 Megohmer by the maker because it combines four instruments in one as follows: 1. Insulation Tester, 0-200 megohms with 500 volts dc test potential. 2. Ohmmeter, scale 0-2000 or 0-20,000 or 0-200,000 ohms. 3. Ac voltmeter, with two ranges, 0-150 and 0-600 volts ac. 4. Dc voltmeter, with two ranges, 0-150 and 0-300 volts dc. The instrument is ideal for plant maintenance men, motor repair shops, electrical contractors, or other applications where it is of advantage to have only one instrument to cover various purposes. The Megohmer is a non-cranking insulation tester with a steady test potential; source of power are two No. 6 dry cell batteries which are stepped up to 500 v dc by means of a special vibrator-transformer circuit. The instrument has, as an exclusive feature, the triple color grading scale which classifies insulation as good, fair or doubtful in three colors. Herman H. Sticht Co., Inc.

New Steam Trap

18 A new steam trap, small in size but having a comparatively large capacity, is available. It is designed for unit trapping installations draining steam heated equipment. Because of its light weight it can be suspended in a horizontal run of pipe without other support. Having two inlet connections at right angles to each other, the trap also may be utilized as an elbow in the line. Screwed inlet and outlet connections are furnished in two sizes: ½ and ¾ in. IPS. The overall size of the trap is 3¼ by 5½ in. and will handle up to 2000 lb of condensate per hour on continuous discharge. At 60 psi the rating is 960 lb of condensate per hour. Valves are accessible through an outside connection and may be changed for various pressures without other adjustments. Valves and seats are interchangeable. The maximum pressure recommended by the manufacturer is 125 psi. Wright-Austin Co.

Rivetless Brake Shoe Linings

19 Announced is the development of a new brake shoe with clamp-on type lining for magnetic brakes for mill and heavy duty service. A vise type clamp on the brake shoe holds the brake lining securely in place and prevents it from shifting in any direction. The clamp consists of a permanent buttress at the lower edge of the shoe with a simple, self-aligning screw jack at the top edge. The brake lining, of folded and compressed metallic asbestos, is placed in the shoe and the clamp tightened. This exerts a force on the end of the brake lining, forcing it into the curvature of the shoe and holding it firmly in place. The manufacturer states that in preliminary



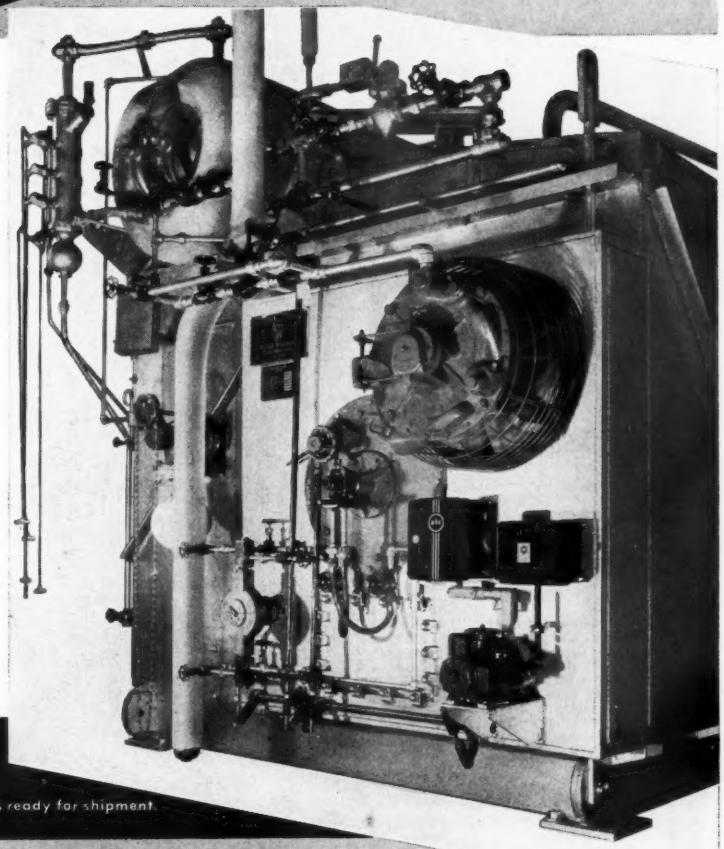
Do you want more information on this equipment and its application? Use the no obligation, no postage card between 10 and 11, 42 and 43

The NEW Foster Wheeler
Package Steam Generator
is...

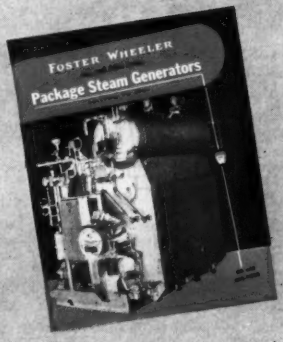
FACTORY ASSEMBLED --READY TO INSTALL

The name "package" applied to these steam generators means that all components, including burners, fans, soot blowers, feedwater regulators, combustion controls, valves, refractory, insulation and other accessories, are assembled in one package at the factory. The local labor necessary for installing this package is limited to service connections.

FOSTER WHEELER CORPORATION
165 Broadway, New York 6, N.Y.



This AG 21-0 package steam generator 21,000 lb. per hour steam capacity, as shown here, is ready for shipment.



FOR
FURTHER INFORMATION
WRITE FOR
BULLETIN PG 47-17

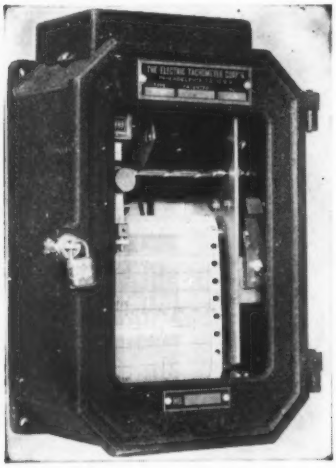
FOSTER WHEELER

New Products and Methods

field tests, on applications such as billet cranes, open hearth chargers, etc., the clamp-on linings gave several times the life of riveted linings of the same material. Cutler-Hammer, Inc.

Production Recorder

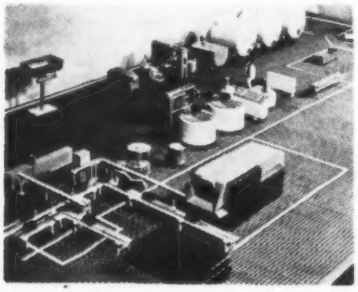
20 A new speed and production recorder, model R-300-H, has been announced. This gear-driven unit is electrically operated and produces a permanent record of speed and production when properly installed on any industrial machine. The recorder consists essentially of a synchronizing contractor which may be attached to and driven by the prime mover or industrial machine. A step-by-step motor in the recording instrument is electrically connected to the contractor and follows its motion. This motor, by means of gears and feed screw, drives a steel stylus across the wax-coated chart. At ½ min intervals the master clock, an integral part of the system, makes contact to



disengage the feed screw which is revolved backwards by a return spring restoring the pen arm to zero. The same contact feeds the chart downward at the rate of 2 in. per hour. This cycle of operations, when repeated, produces a series of parallel lines, the length of which is proportional to speed or production. The ends of the lines form a speed curve. Electric Tachometer Corp.

Scale Model Layout Service

21 A plant-wide ¼ in. scale model service has been announced. The complete plant, regardless of type of industry, it is claimed, can be reproduced in exact scale at ap-



proximately $1.50 per model. All survey drawings and photography are included in this package price. Visual Planning Equipment Co.

Coiled Electric Cords

22 These coiled cords for use with moving tools or parts of machines are coiled retractile cords that extend to standard length of straight cords and retract to a neat 1 ft of tightly coiled cord, out of the way. These cords

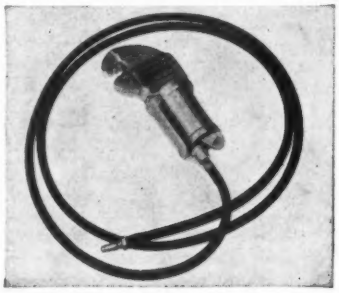
are said to be permanently molded into their spring-like shape, no springs or other mechanical means are used. The smooth, black neoprene is resistant to moisture, oil and grease, and to most of the chemicals with which they might come into contact. Koiled Kords, Inc.

Anti-corrosive Coatings

23 Accelerated laboratory tests indicate that two new types of anti-corrosive Zincilate coatings will air-dry without baking, and will give 20 year protection against corrosion. The coatings are sufficiently flexible that sheets, pipes and forms can be bent double, after coating, without breaking the protective coating. Overcoatings of enamel, paint or wrinkle finishes may be applied over "Zincilate" after five minutes of air drying, and both coatings baked at the same time. Adaptable to production line application by dipping, spraying, brushing or roller coating, with conventional finishing equipment, it is also suitable for maintenance and repair of existing structures. Industrial Metal Protectives, Inc.

Lug Indenting Press

24 A new lightweight, 1¾ lb, portable pneumatic Hypress for indenting smaller sizes of Hylugs and Hylinks can now be obtained. This tool, Polypress Y8NA, achieves its light weight through the use of aluminum alloys. For safe operation, the jaws of the Hypress remain closed with sufficient pressure to hold the connector-and-cable assembly in place and they remain closed



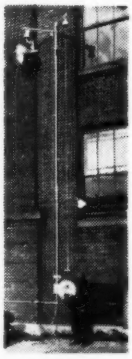
until opened by thumb pressure on the jaw depressor. A long hand-trigger permits use of the tool in any position. Removable dies accommodating conductors from No. 8 to No. 22 AWG are set in compact jaws which allow ample clearance for correctly locating the connector-and-cable assembly for indenting. Polypress delivers about 2000 lb indenting force from an air pressure of 80 to 100 lb. Lower pressure can be used for the smaller size connectors. Burndy Engineering Co., Inc.

Spray Booth Protection

25 New Pigmented Filmite, paint spray booth masking compound, is a ready-to-use, spray-on or brush-on liquid. It answers the demand for a masking compound that will dry white for maximum light reflectivity, dry to a firm, non-tacky, non-greasy surface for resistance against impact, especially suitable for non-slip clinging to overhead areas under heavy overspray load and for masking floors. Product will not flake, crumble or dust, and is heat resistant, making it applicable for booths near ovens. This new material is completely water washable. When hosing is possible, simply wash away the dried paint overspray with hot or cold water. The overspray can also be easily peeled or scraped off the booth walls. DuBois Co.

Lowering Hangers

27 Easy accessibility is the keynote to this hanger that can be raised and lowered from the permanent position for easy servicing. Lowering of the fixture breaks the circuit and renders the fixture harmless. Raising again closes the circuit. Fixture locks in position firmly. The entire raising and lowering operation is a simple manual one because of the regulated pull and release on the small chain or cable. Entire unit consists of these component parts: Operating chain or cable, hanger sheave housing, canopy assembly, upper contact assemblies, upper member assemblies, latchdog of manganese bronze, main spring, slotted guide, and spring housing. Thompson Electric Co.



Illuminated Flexible Rule

28 Now being offered is a new 6 ft illuminated flexible snap back rule for the use of maintenance and construction men in industry. The rule holder is constructed of aluminum and

the rule has etched figures on polished high carbon steel. Encased in the body is a tiny flashlight that illuminates the rule when working in dark spots. Cowhig Industries.

Steam Trap

26 The Dexter Steam Trap has capacities up to 24,000 lb of water. Operating on the float-valve principle, and designed for easy attaching to any steam line from ½ to 2 in., it discharges in a continuous and uninterrupted stream all water and air it collects. Body and head are made of high-quality semi-

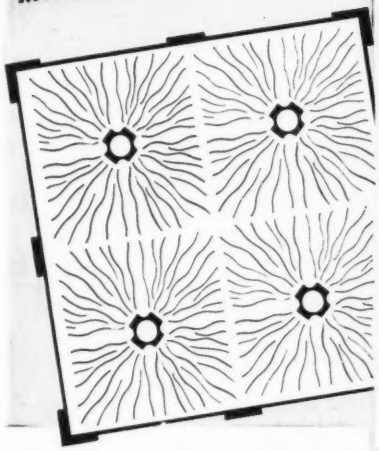
(Continued on page 42)

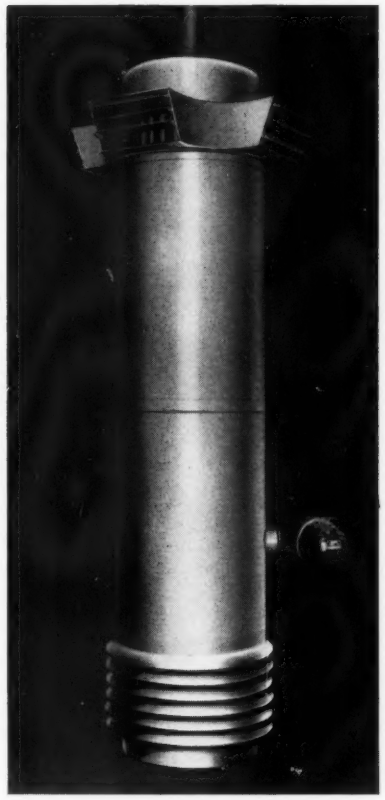
Do you want more information on this equipment and its application? Use the no obligation, no postage card between 10 and 11, 42 and 43

THERMOBLOC

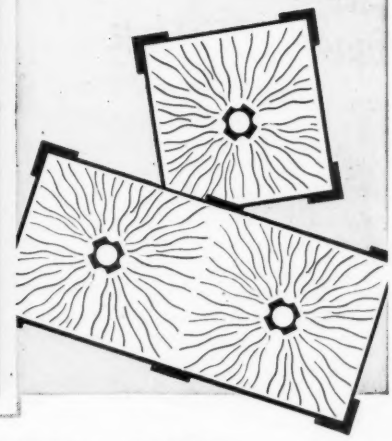
A REVOLUTIONARY NEW UNIT HEATER

PACKAGED DESIGN
•
DRAFT FREE
•
DIRECT FIRED
•
EASILY INSTALLED
•
MINIMUM FLOOR SPACE





EFFICIENCY 82 TO 86%
•
HEAT WHERE YOU WANT IT, WHEN YOU WANT IT
•
FILLS REQUIREMENTS FOR THAT ADDITIONAL HEATING CAPACITY
(refer to diagrams below)



MAY BE USED AS A HEATER — CIRCULATOR — DRYER

Thermobloc is a strictly new, direct-fired unit heater. Revolutionary in design, only 30 inches in diameter, delivering warm air at the working level without draft. Heat output of 550,000 b.t.u.'s per hour has been found to be best suited for draft-free heating. Where more heat is necessary, more than one unit should be installed to deliver the warm air where it is required. Such multiple installations are shown on the above typical plan layout sketches.

Thermobloc is shipped ready for operation, the only installation requirement is an oil or gas line and power connection. This eliminates costly installation, required by steam or hot water heating systems. Completely automatic operation requires no attendant. One or more Thermobloc units, strategically placed in the space to be heated, supply uniform temperature in the winter and gentle, draft-free circulation of cool air, drawn from the floor level, in the summer.

Information on other applications will be sent on request. Clip coupon and attach to your company letterhead.

THERMOBLOC DIVISION

PRAT-DANIEL CORPORATION

72 Water St., E. Port Chester, Conn.

Thermobloc Division
PRAT DANIEL CORPORATION
72 Water St., E. Port Chester, Conn.

I would like to have further information on the New Thermobloc Unit Heater. My heating requirements are ____ sq. ft. floor space.

NAME_____

COMPANY_____

ADDRESS_____

Oil Company

"Without doubt, YARWAY Steam Traps are finest traps ever built. All trap replacements will be YARWAY hereafter."—Oil Company, Texas.

Cleaning Plant

"As soon as we installed the YARWAY trap our trouble ended. Since then, when other traps gave trouble, we put in YARWAYS and they always did a much better job. Now we use all YARWAY traps," says Maintenance Engineer of large mid-western cleaning firm.

Dairy Company

"YARWAY Traps have been a life-saver here. Used many different makes before trying YARWAY a year ago. Haven't touched them since. Trying to get management to buy more."—Large Wisconsin dairy.

Dye Works

"Use a good many YARWAY Traps here—like them very much on dryers. Take up little room and discharge condensate as fast as it comes through the line, causing coils to heat up faster and hold steady temperature."—Globe Dye Works, Philadelphia, Pa.

SPEAKING OF STEAM TRAPS

Laundry

"Ironer is so hot it sizzles after putting YARWAY trap on in place of a bucket trap. Run heavy spreads through ironer once and they are dry. Pulling out all bucket traps and will replace with YARWAYS."—Farina Laundry Co., Vancouver, British Columbia.

Power Station

"A great many YARWAY Traps are used here and have been very successful . . . some of these traps have been in use since 1939 and have given absolutely no trouble."—Herkimer Municipal Power Station, Herkimer, N. Y.

Florist

"Coal bill last winter was $5,000 less than previous winter. Didn't know whether they could give YARWAY Traps all the credit, but they were entitled to a big share of it."—Meyers and Santman (Greenhouses), Wyndmoor, Pa.

Hospital

"Ten years ago replaced an.....trap with a tiny ½" #60 YARWAY on an ironer. Never had such good results before. Trap has never been opened and still going 100%. Since then have bought nothing but YARWAY Traps and will specify them for new addition."—Northern Wisconsin hospital.

Textile Plant

"One large press formerly equipped with a bucket trap wouldn't heat lower platen. A ¾" YARWAY Trap was installed and since then full production has been maintained. This represents an increase of 20% in production."—Southern textile mill.

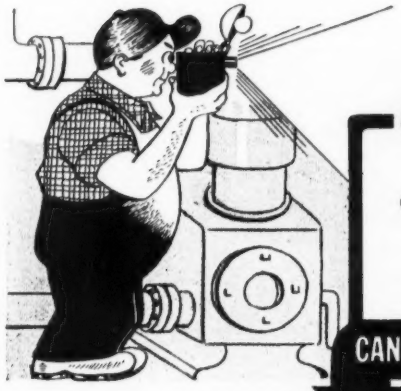
ACTUAL SIZE ½" TRAP

NEARLY 600,000 BOUGHT!

ORDER YARWAY TRAPS FROM YOUR NEAREST MILL SUPPLY DEALER. FOR NAME AND FREE TRAP BOOKLET, WRITE . . .

YARNALL-WARING COMPANY 145 Mermaid Avenue, Philadelphia 18, Pa.

YARWAY IMPULSE STEAM TRAP



Safety Crimes

CAMERA CATCHES SAFETY BUSTERS IN ACTION

It's all too easy to forget the common rules of safety. The Safety Busters shown on this page are to remind you of some situations which you should avoid. Accidents are not born, they are made

CAN YOU POINT OUT THE DANGER CLUES IN THESE PICTURES?

Fig. 1. Left: Painful burns can come from careless acts as this experience of a cable splicer proves. All photos courtesy of Sunshine Service News published by Florida Power & Light Co.

Fig. 2. Below: The cable splicer's helper, heating metal for the splice has dropped the ladle on the wet ground and is here shown reaching to retrieve it

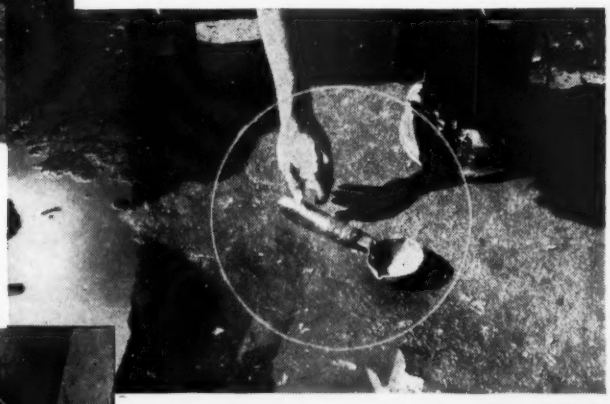


Fig. 3. Below: Without giving the incident a second thought he dips the wet ladle into the molten metal

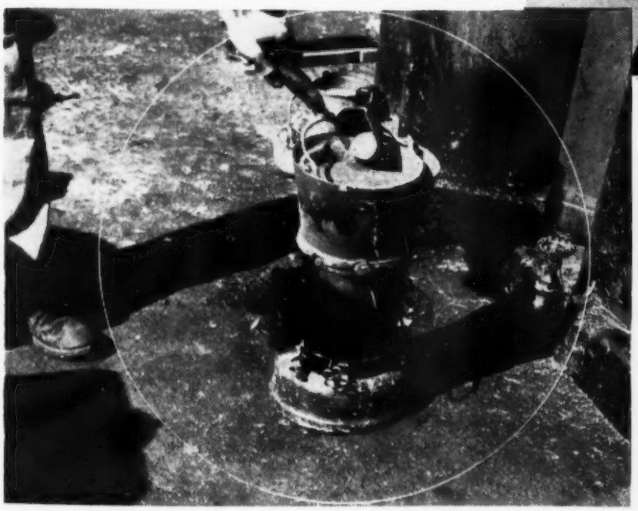


Fig 4. Right: And here's the result: he receives painful burns from the ensuing splattering of metal. The molten metal has been known to splash as high as the neck and face

Exhaust System for Precious Metal Recovery

The recovery of gold and maintenance of workers' health is the basis for this well-engineered dust recovery system . . . Partial recovery accomplished with cyclone separator . . . Air then passed through electric precipitator with final removal of gold dust . . . De-greasing system presents problem of fume control, solved by exhaust installation

By **BRUCE JONES**, *Plant Engineer, Wadsworth Watch Case Co.*

IN THIS PLANT the nature of the product demands close and continued study. The work is so exceedingly delicate, and the product of such fine dimensions and intricate nature, that a large proportion of the 950 people employed here work constantly with jewelers' glasses. The raw materials are precious metals and this necessitates the employment of special methods of salvage and recovery. Scraps, chips and even the dust of the processes must be recovered or the dollar waste would become unbearable.

Some examples of the conditions which prevail (and the problems which these conditions pose) are cited below. One of these is a process which involves the making of a tiny pipe-like piece of metal, ⅛ in. in diameter by 7/16 in. long. The first operation is performed on a stamping machine which has a battery of six dies in a row. The machine operates at the approximate rate of 60 cycles per minute. The first die in the row punches out a blank from the strip of metal. This material, incidentally, is a bimetal strip, gold on one side and base metal on the other. This first die produces a round piece of metal, much like a dime in thickness and diameter. On the next stroke of the machine the second die has had the piece placed under it automatically and the start of a deep drawing process has commenced. At the end of the line the miniature tube drops into a basket, complete to the required dimensions with the gold on the outside and the base metal on the inside. There has been no separation of the bond between the two metals nor any imperfections in the gold covering the finished job. The operation of the machine is entirely automatic.

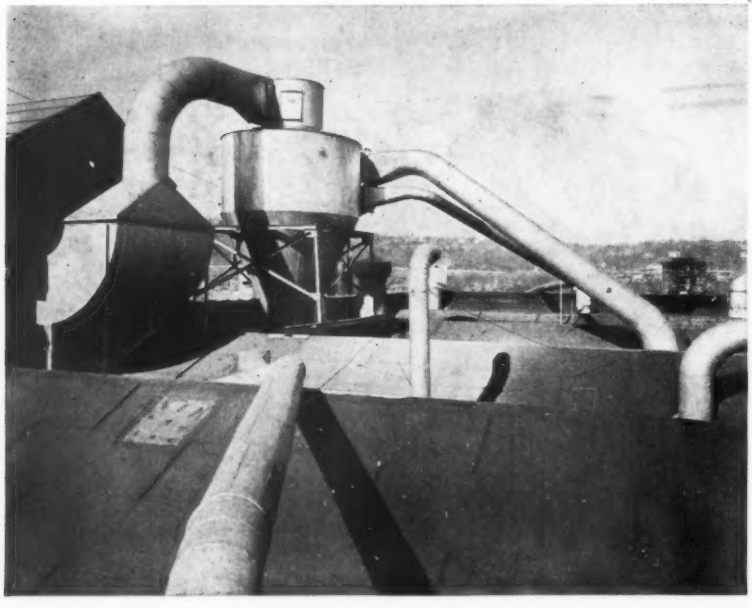


Fig. 1. This is the cyclone collector in the precious metal recovery system. The Cottrell Precipitator is in the casing at the extreme left

The method of cutting the threads for screwed-on type watch cases is another highly complex operation. The thread on the female part is cut on a tiny double-spindled lathe whose threading tools are exactly the same as those on large lathes.

The watch case threading machine is entirely automatic and all necessary adjustments are managed by finely threaded parts that can be set with the highest degree of accuracy. The two chucks take in the blank pieces in exactly the same position every time. The tool then travels to the absolute bottom of the hole or recess. Here the carriage is withdrawn for the next cut. The tool is re-set automatically for depth and the cycle is repeated until the threads are cut to size. The last two passes are mere scraping cuts, with the tools just barely touching the stock. The double spindles are responsible, not only for the headaches which occur in setting up the machine, but also for the fact that the work can be done at all. Remarkable skill and tireless patience are necessary to get all dimensions set up exactly as required.

The greatest chance for waste salvage occurs in the room set aside for the manufacture of solid gold watch cases. Here, in a comparatively small room, all stock is carefully weighed out to each operator at the start of every job and here all finished goods are weighed back in, together with all scrap at the end of each job or period. Each employee strives mightily to maintain a good record on salvage recovery.

The floors in this room are tightly covered with roofing felt. The felt has a layer of steel matting placed on top of it so that the gold scrap can fall through to the felt and not be carried

Fig. 2. (left) These individual suction pipes serve the various buffing wheels used in the final polishing process. From this room the dust is carried to the roof and passed through the cyclone shown in Fig. 1

Fig. 4. (below) The production buffing machine for polishing base metals is shown in this photograph. The product to be polished is carried on jigs around the periphery of the disc and is polished by the buffing wheels. One of these wheels can be seen in the center foreground

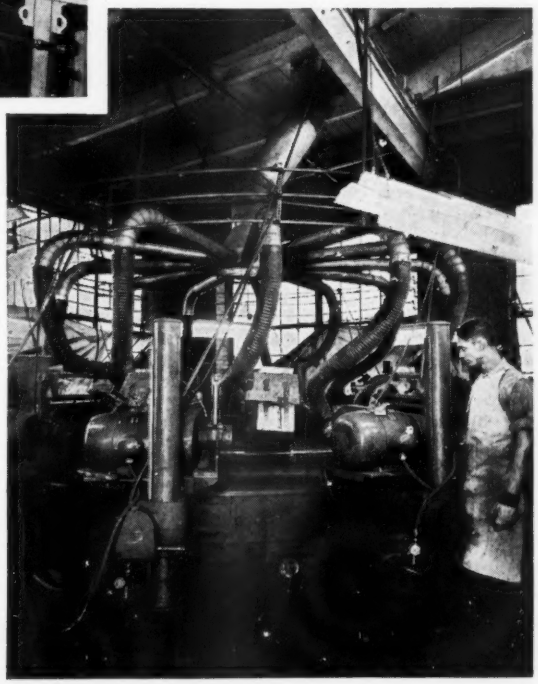


Fig. 3. (above) From the base metal buffing machine the dust is carried to this cyclone. The house at the bottom of the cyclone covers the motor which powers the fan; the motor is a 40-hp unit direct-connected to the fan

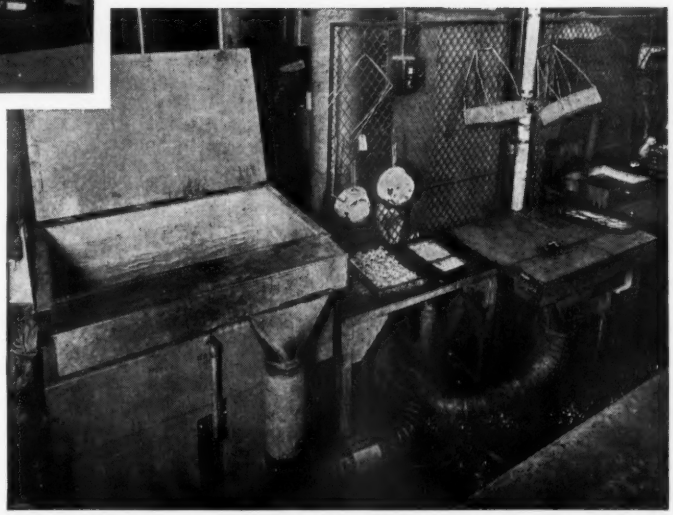


Fig. 5. (right) This is the de-greasing system. The exhaust ducts convey the chemical fumes out through the roof into the atmosphere. The two tanks are filled to different levels with a chemical solution, similar to carbon-tetrachloride

out on the shoes of the workmen. This steel mat is removed regularly and the felt is cleaned. Periodically, however, the felt floor covering is replaced and the recovery of gold via a more thorough process makes the operation profitable.

The stock for the gold-filled cases is made by placing a bar of base metal, approximately 1 in. by 2 in. by 10 in., in a heavy clamp together with a bar of gold, ⅛ in. by 2 in by 10 in., with a strip of solder between them. The group is then subjected to heat and high pressure until the solder fuses. After cooling the bar is rolled till the base metal is the proper thickness for watch case parts and the ductile gold is only two or three thousanths inches thick. Strips of this stock are the raw material and it must be punched and drawn and worked in the production machinery.

The stamped and worked pieces must later go to the polishing room where each piece is buffed. This polishing process must be finely controlled so that no holes or thin parts are worn through the thin overlay of gold. Then, because gold is worth $35.00 per ounce, all dust and chips must be carefully salvaged. The dust, invisible to the unaided eye, is thrown from the buffing wheels where it is collected by suction-served hoods and pipes through the medium of the duct work shown in Fig. 2. The dust is then carried to the roof by a 30 hp direct-connected fan and delivered to the cyclone collector illustrated in Fig. 1. This collector catches the greater part of the dust and delivers it to a receptacle beneath.

This partial recovery is not sufficient, however, to satisfy the demands of economy. The exhaust air is continued from the cyclone through a Cottrell Precipitator (this, too, is shown in Fig. 1). Vertical plates in the precipitator are interspersed with verticle rows of horizontal rods. The whole precipitator has a static charge of 70,000 v. As the dust is blown through it becomes charged either positively or negatively and is then attracted to the element that carries the opposite charge. There it is held until the unit is de-energized and the dust drops down into a container beneath. Later, it is sent to an incinerator to have combustibles burned away and leave the residue of precious metal for the final refining process.

Recovery of precious metals is not the only reason for the dust recovery system. Health of the operators must be guarded, also, and the cleanliness of the work rooms maintained. For these reasons, the dust from the buffing wheels which are used on base metal parts, such as compacts, must be collected in a separate system. The same suction is used; this is a vacuum of 5 in. water column, or better.

The base metal blower system is divided into two parts. One of these parts is a large collector serviced by a fan driven by a 100 hp motor through a set of V belts. The smaller collector, shown in Figs. 3 and 4, is serviced by a fan direct-connected to a 40 hp motor.

The production machine which is served by the smaller system is shown in Fig. 4. It is essentially a horizontal, 12-ft disc or platen revolving counter-clockwise and carrying near its outer edge a number of stands. Jigs, which are designed to revolve horizontally, each one of them holding a compact, are mounted on these stands.

As the revolving jigs pass under the buffing wheels they are free to turn and thus present a different position to each buffing wheel. This means that the cases will receive a much better polish than if they were held rigidly.

Each of the buffing wheels is served by individual hoods on branch ducts radiating from the main duct system like arms from an octopus. These branch ducts are flexible rubber hose attached to sheet metal elbows. From the buffing machine the dust laden air is transmitted to the cyclone collector shown in Fig. 3. The fan motor and V-belt drive are in the box-like structure just below the collector, protected from the elements.

During the processes of die-stamping, deep drawing, bending, etc., many of the parts are well drenched with grease to facilitate the work. These parts must later be de-greased. This is accomplished in the apparatus shown in Fig. 5. Its two tanks are filled, to different levels, with a chemical solution which resembles carbon tetrachloride. In the right-hand tank a steam coil is installed. In normal operation this coil is covered with boiling chemical while the hot fumes, heavier than air, stay close to the surface of the liquid from which they have just risen. Above the fume zone is an air suction which exhausts the excess fumes through the roof. The fan which operates this system is a 2,100 cfm displacement unit.

When operating the de-greaser, the workman slowly lowers a wire mesh basket filled with parts into the hot fumes in the chamber. The temperature differential causes the fumes to condense on the cooler, greasy parts thereby cutting away the grease which covers them. Then, as the operator slowly raises the basket out of the fume zone into the suction zone the exhaust system carries the fumes and condensed liquid up the suction pipes into the open air. If the grease is too heavy to be removed by the hot vapor the basket of parts may be cleaned by dousing it in the cold chemical at the left. The drying operation is then repeated.

The complete dust recovery and collecting systems were engineered and installed by the Kirk & Blum Mfg. Co. of Cincinnati.

Care of New and Used Paint Brushes

SOME OF the bristles in paint brushes are porous and will absorb pigment particles, thinners, etc. This can be prevented by soaking them in raw linseed oil before using them, for from 48 to 72 hr. This will make the brush more flexible, easier to clean and better to use. Wrap the brush before suspending it in the linseed oil. Fold it in heavy paper five times the width of the brush and large enough to cover the bristles on both sides from ferrule to ferrule. The brush will now hold its shape and may be rested on its end. Place the wrapped brush in a can of linseed oil so the oil level is above the top of the paper. Unwrap every 24 hr and work fresh linseed oil into the bristles.

When the brush has been soaked sufficiently draw the surplus oil from the bristles by spinning between the palms of the hands. Then rinse the bristles in mineral spirits or turpentine until all excess oil is removed. The brush is now ready for use again.

In order to always keep a brush in good shape clean paint or enamel from it after every use; work the paint or enamel out in turpentine or mineral spirits. Do not press the brush down endwise as this will force it out of shape. Work the solvent well into the heel.

To remove paint clinging to the bristles lay the brush on a flat board and scrape the bristles with a blunt putty knife. Work again in the solvent and scrub out the loose paint with a stubby 1 in. brush. Rinse again in thinner and spin to remove all liquid. Then transfer the clean brush to clean thinner and rinse out as much as possible.

Save the dirty thinner. When it stands the pigment will settle to the bottom and the thinner can be poured off and used again for cleaning. After the brush has been cleaned suspend it in raw linseed oil by hanging it from the handle. Again, it is best to wrap it before suspending it. When the brush is to be used again remove the wrapper and spin it to remove the linseed oil. Then rinse in paint thinner. Do not clean a paint brush with paint remover or diesel oil; they will ruin the brush.

The heel of any paint brush is literally its Achille's heel. In painting don't dip the brush into the paint up to the heel. This will allow the paint to get into the heel where it will accumulate and cause all kinds of trouble. Do not use a good brush endwise in pinch-tight corners, recesses and the like. This practice rounds out the corners and also causes the brush to "finger" making it useless for cutting sharp lines.

Fan Repair Saves $4,938

Unable to get delivery on a new fan immediately this company repaired the one which had been destroyed by abrasion and centrifugal force . . . The savings were estimated on the basis of time which would have been lost, actual cost of replacement with a new fan and the increased expense of manual disposal of sawdust and woodwaste

By **FRANCIS ECKERT,**
Lloyd Manufacturing Co.

A MAJOR BREAKDOWN occurred in the wood fabricating department of our company recently. One of the vanes on the master suction fan servicing this department broke loose from its support, tore through the steel housing plates and completely paralyzed the exhaust system of the department. Sawdust and wood waste disposal in a large woodworking plant is an extremely important function and a breakdown can have a crippling effect on the production of the entire department.

The heart of the exhaust system is a high speed suction fan which draws sawdust from all the machines through custom-built intakes. The fan performs a dual job; it not only draws the sawdust from the department but it also blows it up into a cyclone from which it is automatically conveyed to the boilers for fuel.

After the fan had smashed itself a preliminary examination was conducted which revealed the damage to be serious. It was a conventional six-vane type of fan with single T-iron arms; it was powered by a 75 hp motor driving it at 1160 rpm at full load. Friction from flying chips and debris had weakened the rivets on one of the vanes to a point where it was torn off by vibration and centrifugal force, shearing its arm at the hub. Contiguous arms and vanes were thrown out of alignment and a gaping hole was torn through the steel plate housing. Further examination showed that the rivets on the other vanes were badly worn and they would have given away in a short time.

Obviously, immediate replacement was necessary if the department was to maintain its scheduled production. Without an exhaust system frequent shutdowns would be necessary to clean up the shavings and sawdust around the various machines. Efficiency would be impaired and the flying chips and sawdust would be a definite hazard to the safety of the operators. A decrease in production in the wood department would soon be felt in other departments dependent upon it for parts.

Several manufacturers of blowers and fan equipment were contacted to find out what delivery could be promised. This was a greater length of time than could be tolerated so the possibilities of repairing the damaged fan were explored. Up to this time repair had been considered impracticable because of the drop-forged construction of the hub assembly. Facilities adequate to forge this size of vane arm into the hub were not available for miles around.

A complete redesign of the fan's assembly was finally decided upon after a conference of the shop's engineers. The first operation was to burn off, with an acetylene torch, the arms from the hub of the fan to the base of the forging. This done, the hub was only a cylinder with six recessions or slots and was keyed to a shaft. Two hub discs, 15½ in. in diameter were then turned out of drop forged steel blanks. These were bored to fit over the two ends of the hubs and its keyways without making any alterations to the hub necessary.

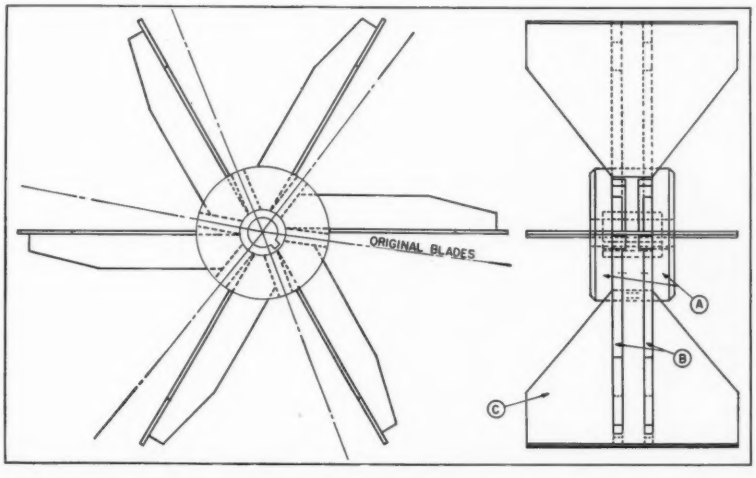
Before mounting the discs on the hub, six 24 in. steel arms were arc welded to the face of each disc forming two independent rotors. These two rotors were then mounted at each end of the hub with the welded arms fitted into the recesses that formerly held the T-iron supports. The assembly, at this point, had complete vertical rigidity and had the appearance of a rotor with six pairs of parallel arms keyed on a drive shaft with no lock at either end of the hub.

Vanes of ¼ in. steel plate were then welded to each pair of arms, firmly locking both rotors into one unit and giving the assembly horizontal as well as vertical rigidity. After testing the vanes for balance, the newly assembled fan was enclosed in its original housing; gashes in the perforated housing plates were hammered back into shape and arc welded. The finished appearance of the fan is shown in the accompanying drawing.

Four days after the breakdown, an efficient repair job had put the fan back in operation. This represented a substantial saving in time when compared to the four weeks that would have been required for replacement with new equipment.

Maintaining continuity of operation was the most essential and vital factor, regardless of cost. It was calculated, however, that total replacement cost, including lost production, cost of new fan (taken from quotations) and cost of disposal of sawdust manually, would have been $5964.00. The entire cost of repair, including materials, labor, lost production and sawdust disposal for four days was $1025.79, or a saving of $4937.21.

This article was taken from material submitted in the 1947 competition sponsored by The James T. Lincoln Arc Welding Foundation, "Design for Progress."



This drawing shows the manner in which the suction fan was repaired. A—The hub discs which were bored to fit over the ends of the hub and its keyways. B—Six of these 24 in. steel arms were arc welded to the face of each disc forming two independent rotors. C—The vanes of ¼ in. steel plate which were then welded to each pair of arms

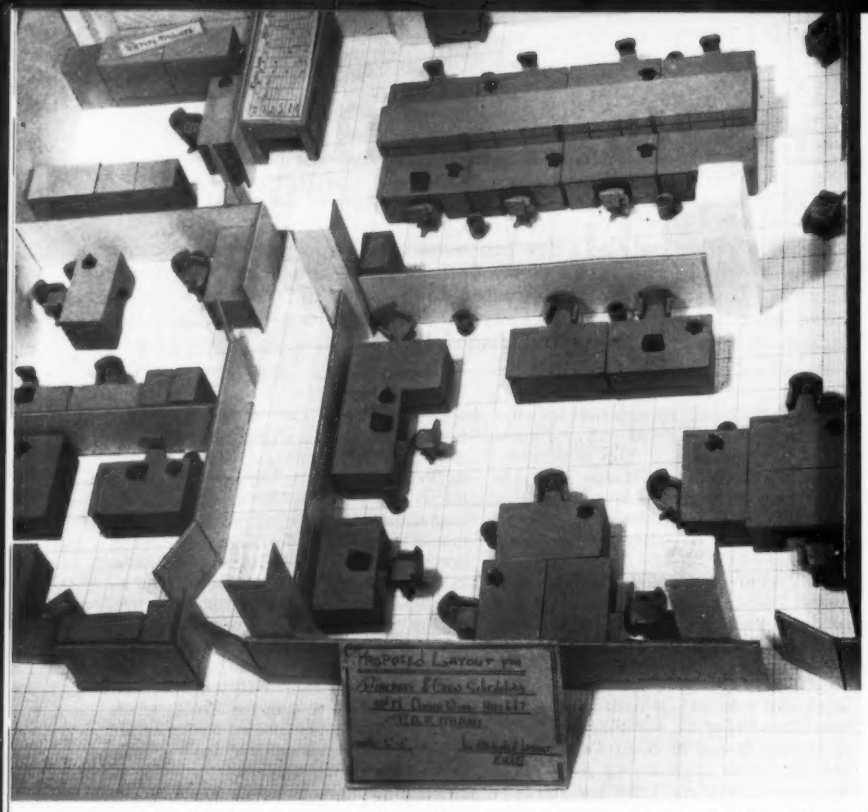
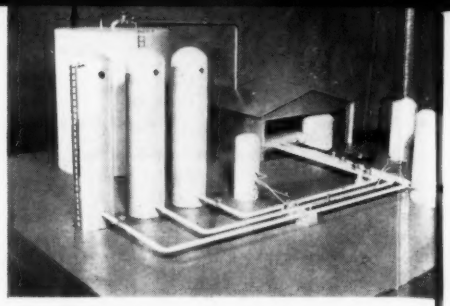


Fig. 1. This is a visual planning layout of the aircraft and crew scheduling office at Pan American World Airways' Latin American Division headquarters in Miami. These models are now saving the company an estimated 75 per cent on office planning costs



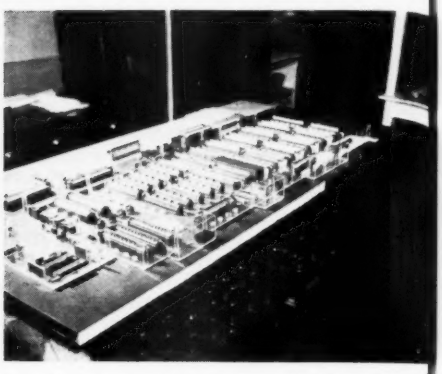


Fig. 2—Top. Engineers of one division of DuPont solved many chemical processing problems quickly through the use of ¼ in. scale processing equipment. Fig. 3—Bottom. In order to properly arrange its complete plant facilities the Magee Carpet Co., Bloomsburg, Pa., used this completely furnished scale model of one of its main plant. Many industries have found this method of planning pays good dividends.

How to Use Scale MODELS for Easier Planning

Scale models of practically any type of manufacturing equipment are available for use in laying out proposed plants or plant changes. The same technique may be used for office planning. This article tells some of the advantages to be derived from three-dimensional models

PLANT AND departmental layout, while not yet reduced to the fundamentally simple terms which would permit it to be called a science nevertheless has been aided and simplified these past few years by the spreading use of three-dimensional models.

The use of these models in nearly every case where they have been employed has involved three steps: Obtaining a floor plan of the space to be occupied; preparing or obtaining the models;* and arrangement of the models on the floor plan. A fourth step, the ultimate refinement of all planning, has been the actual construction of an entire model plant. Clear plastic plates, plywood sheets, and flexible plastic or thermoplastic tubing have been used by many organizations as materials for their miniature housing structures and water, steam and process lines.

A tremendous amount of preliminary work is necessary, of course, before the final planning can be made. A complete survey of the work to be done must be made; this includes a review of the manufacturing processes and the manner in which the work is to be carried on; how the work of one department is related to that of another; the sequence in which the work flows; the amount of material handled and by what means; the number and type of machines used and what the future requirements may be. It is not the purpose of the scope of this article to cover these preliminary steps but, rather, to point out to the plant engineer how scale models will help him in planning proper materials handling routes; water, steam and other process lines; to show him where floor loading will be greatest; to aid him in planning preventive maintenance schedules and to help in dozens of other ways.

One of the biggest stumbling blocks in the previous use of two-dimen-

*Names of manufacturers of these three-dimensional models will be forwarded on request to The Editor, PLANT ENGINEERING, 53 W. Jackson Blvd., Chicago 4, Ill.

Fig. 4. The Chief Engineer of Waldes Koh-I-Noor Corp., Long Island City, N. Y., B. Zenaty, points out to his aides proposed changes in a section of the plant. On the table is a complete Lucite building and ¼ in. scale machine tool and processing equipment

sional templates was the fact that the plant engineer, while working in outline dimensions only, he did devote a great deal of his thinking energy to remembering shapes, sizes, heights, and overhangs of equipment and consequently wasted valuable time in translation. He was unable to devote his full energies to the planning problems involved, but, rather, had to be concerned with recollections and information which necessarily are a part of his planning effort.

When considering new plant layout the arrangement can be such as best suited to the process, providing study is made of the requirements before the plant is designed. However, with an existing plant it becomes necessary to fit the processes into the plant in the best possible manner. In the first conception of the job, the rough layout, these process areas can be laid out for size and for their relationship to other departments in the plant.

As soon as these departments have been located and established the finished layout can be made and the scale models of the necessary machinery and equipment can be fitted into the areas allotted each department.

By means of miniature conveying lines and plastic tubing a temporary hook-up of the various elements concerned can be made. This will allow a quick visualization of any traffic blocks and allow the plant engineer to rearrange equipment to avoid these bottlenecks. When what appears to be a satisfactory arrangement has been arrived at, but still further experimentation is in order, several plants have resorted to photography as a means of keeping a permanent record. If still further attempts to improve the layout should fail it is a simple matter to return to any of the intervening steps which seemed more practical.

Separate colors are often used for differentiating between old and new or future equipment. If photographs are planned it is necessary to select colors which will photograph differently and show a marked difference on a black and white print. Colors which show up as different shades when reproduced are salmon, fawn, yellow, green and cherry. When making a photoprint it is well to use color screen to bring out the contrast. A layout in contrasting colors assists in visualizing the arrangement.

When the final arrangement has been agreed upon by all departments concerned the models may be fastened to the floor by the use of rubber or other nonhardening cement.

Scale models have just about been accepted as standard practice in shop and office planning at Pan American World Airways' Latin America Division headquarters in Miami, Fla. C. Preston Stout, division supervisor of methods and layouts, said his department is currently slicing planning costs as estimated 75 per cent through the use of scale model planning units. PAA is currently using the new system only for general office layout. However, Mr. Stout pointed out that future airline plans call for visual planning units for shop and maintenance departments and possibly airports. Mr. Stout estimated that streamlining procedure not only cuts costs by three-fourths but speeds up planning by at least 50 per cent. The illustrations in this article were through courtesy of Visual Production Planning, Inc.

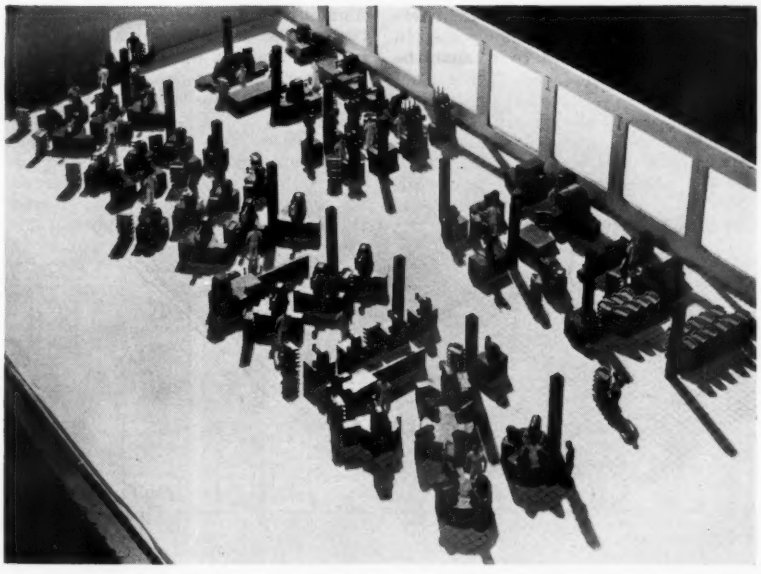


Fig. 5. Remingtons Arms Co. engineers solved a highly complex problem of materials handling through the use of models. Even miniature scale-size men were used in order to properly locate work areas

How to Keep FLOOR LOADS Within Safe Limits

Difficulty of determining safe load limits. . . . Study of machines or stored material to determine relation of floor members. . . . Constantly changing stock presents a different problem. . . . Indicating load limits for varying stock. . . . Skids or pallets ease task of figuring loading. . . . Use of multiple deck skid racks to cut necessary storage space

By WILLIAM W. GAYLORD *Consulting Engineer*

IN all factories other than those consisting entirely of one story buildings with no basements the problem of keeping floor loads within safe limits is always present. Most modern machines are heavier than the types formerly used in many lines of manufacture and present methods of handling stock material, work in process and finished product all tend to produce heavier floor loadings.

The first step, of course, is to find the load the floor will carry safely. The plans and specifications for most buildings give the uniform floor loads for which they were designed. If these safe loads are not given it will be necessary to calculate them. This can be done quite simply where the floor construction is exposed, but may be much more difficult with flat slab concrete floors where there is no record of the reinforcing steel used.

Having established the safe loads for the floor this should be posted in conspicuous places where it cannot be easily hidden or defaced. This will, of course, not prevent the overloading of floors but will give a basis for checking floor loads. Some one person should then be given the responsibility of seeing that the safe loadings are not exceeded and the authority to enforce this ruling.

Machinery and equipment are usually concentrated loads rather than the uniform loads for which the floor was designed and while their total weight may be less than the total uniform load for which the floor was designed they may cause local stresses in floor members in excess of the designed safe stress. If heavy machines are to be placed on floors designed for relatively light loads this should be checked before machines are installed. A simple example shows why this is necessary. Assume a machine which takes up a total floor space of 5 ft by 10 ft and weighs 6,000 lb is to be put on a floor designed for 125 lb per sq ft. If the load of the machine could be uniformly distributed over this area it would be entirely safe, but the base of the machine is only 3 ft by 4 ft so that the load on the floor under machine base will be four times the designed load. If this base comes directly over a main supporting beam it still may not cause any over stress in the floor construction but if it comes at any other point it will.

If a study of a layout of machines and equipment shows that none of the floor members will be over stressed by the weight of the machines plus the usual amount of material and finished parts stored adjacent to the machines the layout will be satisfactory, but if any part of the floor is shown to be over stressed either the layout should be changed to avoid this or the floor reinforced before the equipment is installed.

A satisfactory layout will reduce the danger of overloading the floors in the operating areas to a minimum but the same does not apply to areas where raw materials, stock in process, semi-finished or finished parts are stored. Here materials are constantly being put in and taken out by men who usually have little, if any, idea of the floor load caused by the materials they are handling and the usual practice seems to be to pile in all possible material in the most convenient places.

Materials vary so much in bulk and weight that it is often difficult to establish simple rules to control floor loading in storage areas. Especially is this so if the building is of reinforced concrete construction. In this type of building it is impossible to tell even approximately what safe load it will carry unless access can be had to the plans or specifications.

For instance if the columns are 20 ft on centers and the floor is 8 in. thick it may be designed for as little as 125 lb per sq ft, the minimum allowed for factory buildings by most Building Codes; or as much as 250 lb per sq ft if the maximum practicable reinforcement is used. To add to this there are at least three different arrangements for placing the reinforcing steel that would affect its ability to carry heavy loads when only a part of the floor area is to be covered.

This clearly illustrates the need of posting the safe floor loads and the desirability of indicating the area in which loads heavier than the allowed uniform loading can be placed when only part of the floor is to be covered. There should also be an indication of the maximum allowable load when only designated areas are covered.

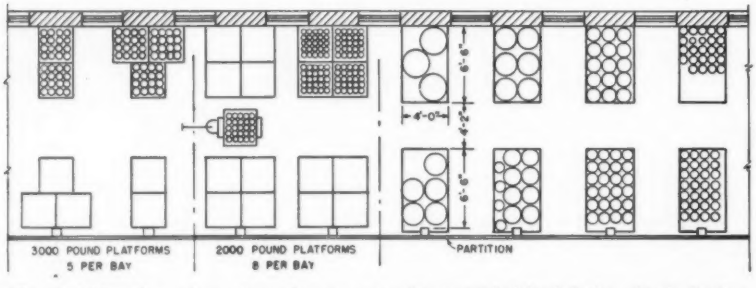


Fig. 1. This plan view of a storage area for semi-finished lathe chuck bodies indicates the manner in which the floor is marked and the weight of loaded platforms determines how many platforms can be in each bay. The weight and number of skids is marked on the wall

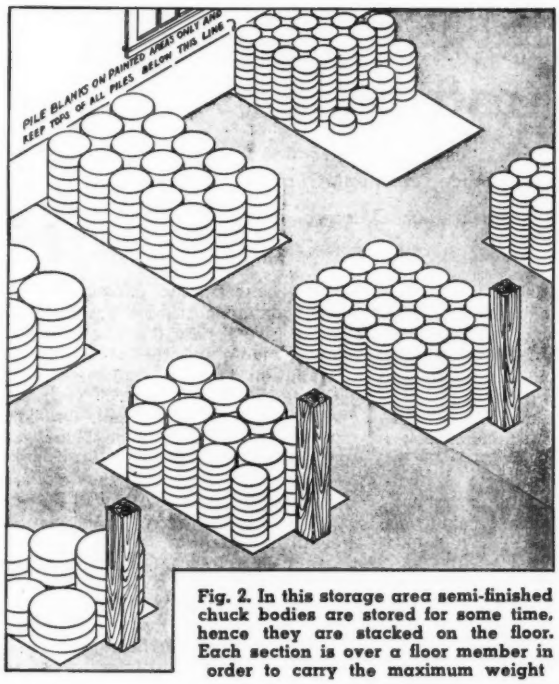


Fig. 2. In this storage area semi-finished chuck bodies are stored for some time, hence they are stacked on the floor. Each section is over a floor member in order to carry the maximum weight

What can be done in the way of indicating areas to be covered and maximum heights of piles is indicated in Figs. 1 and 2 which shows another type of building. This is a semi-mill type building where it was necessary to store semi-finished parts of machine tool chucks for a stock ahead of the assembly department.

These parts consisted of chuck bodies and backs, which were in the form of thick discs varying in diameter from 5 to 36 in. and in thickness from 1½ in. to 6 in.

The chuck bodies had had jaw slots milled in one side and fairly large holes bored through the center, so that the average weight was about one half that of a solid disc of the same outside dimensions. These in sizes 10 in. dia. and above were delivered to the storage room in small lots on two wheel hand trucks and piled directly on the floor. The sizes 9 in. dia. and smaller were delivered on 3 ft by 3 ft platforms handled by small hand operated lift trucks and were stored on the platforms. These came in two types, one for independent four jaw chucks where the platform loads averaged about 3,000 lb and the other for the three jaw universal chucks where the platform loads averaged about 2,000 lb.

The building was 38 ft wide and had a splined plank floor resting on beams 8 ft on centers which were supported at the outer ends by the brick walls and at the center on wooden columns. The floor was designed for a live load of 125 lb per sq ft and the walls, beams and columns were found to be in good condition. The space from the center columns to one wall of the building was to be allowed for the storage of this material. It was found that the arrangement shown would allow the storing of an average of 5 of the 3,000 lb platforms per bay or 8 of the 2,000 lb platforms per bay and the moving of a truck with loaded platform through the aisle between them without overloading the floor. The spaces where the loaded platforms were to be placed were indicated by painting these areas of the floor white. Where the chuck bodies were to be piled directly on the floor it was found if the piles were kept to a size 4 ft by 6 ft in. over the ends of the beams as shown and the piles did not exceed 25 inches in height this too would give a safe loading. These areas of the floor were also painted white, with a black line 25 in. above the floor painted on the wall and columns to show the limit of pile height. This gave the men handling these materials a guide to work to and made inspection very simple.

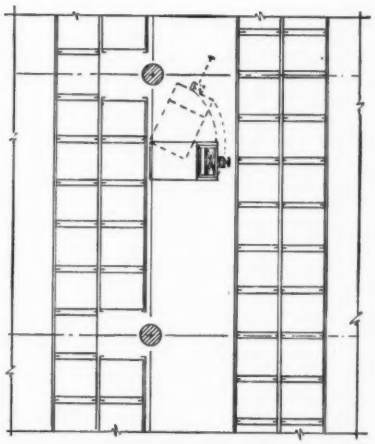


Fig. 3. The use of triple deck skid racks makes use of all space possible in conformance with load limits

In another part of the same factory, discs, about 12 in. dia, cut from ⅜ in. steel plate were used as cover

Fig. 4. This storage on the top floor of a factory takes advantage of vertical space right up to the roof girders

Fig. 5. Here a light weight item of cardboard is stacked to the rafters, thus using every inch of space

plates for gear cases on chain hoists. These were usually piled near the machines where they were to be drilled and many piles four ft or more in height were found. This of course was a floor loading of over 1,500 lb per sq ft for the area covered. Here a maximum pile height of 15 in. was established and although this allowed a loading of about 4 times the safe uniform loading for the areas covered by the piles, these areas were so small, and so located relative to beam and plank spans, that it caused no serious overloading of the structure.

Another example is where semi-finished parts were to be stored in 3 ft by 3½ ft by 2 ft skid boxes on the third floor of a 60 ft wide reinforced concrete building of flat slab construction with the floors designed for a uniform load of 250 lb per sq ft. The standard loads per skid box were found to average between 1,600 and 1,800 lb with a few going as high as 2,000 lb. It was necessary to store these in such a position that any skid box could be removed at any time without rehandling any of the others and to get the greatest practicable number of the available space. By using the layout shown in Fig. 3 with three high skid racks similar to those shown in Fig. 4 from 60 per cent to 75 per cent of the full safe uniform load could be stored without over stressing the floor slab.

Use of Pallets

Where materials are shipped and stored on pallets that may be stacked one above the other for storage it is usually easy to limit floor loads by limiting the height of the piles to a given number of pallets. To make this effective someone must check the load per pallet and establish the height of piles.

Figure 5 shows knocked-down cartons stored to the ceiling which is safe in a 250 lb per sq ft floor but when a carload of knock-down pasteboard boxes were received on 36 in. by 36 in. pallets it was noticed that the height of load on each pallet was only about three feet so a check of the weight was made. This showed each pallet weighed between 1,150 and 1,200 lb and that they could not be stored more than two high without overloading the floor.

The above examples show a few methods that have been used successfully, but conditions vary so much in different plants that usually each must develop its own floor loading control system to suit its own buildings, products and methods of handling materials. The system should be as simple as possible but must be sufficiently detailed to cover all of the usual materials handled or stored at the plant. Having established the system someone must be given the responsibility of keeping it in operation and of making regular inspections to keep loading within allowed limits.

Industrial Insurance—Policy Restrictions

By **FREDERIC OAKHILL**, *Vice President, Charge of Engineering, National Research Bureau, Inc., Chicago, Ill.*

REASONS for industrial insurance and how it may be used to advantage by business and industrial concerns, have been covered in the previous article[1]. It is essential that each policy cover the type of insurance desired and that such coverage be handled in the most economical manner. Likewise, it is necessary to know of restrictions which may be in the policy and which would nullify its protection because of certain conditions known to exist.

Policy Restrictions

Practically all insurance policies contain restrictive clauses and should be thoroughly read so as to be understood because under certain circumstances a policy may become voided. The Fall of Building clause is such a restriction and generally reads: "If a building or any material part thereof fall except as the result of fire, all insurance by this policy on such building or its contents shall immediately cease."

Average (pro-rata) clause is attached to fire, tornado, and sprinkler leakage policies when covering more than one unit (detached building, or contents of same) under a blanket amount. This clause makes the insurance coverage per unit equal to its percentage value of the total coverage.

Industrial insurance clause requires the insured to carry a certain amount of insurance, usually 80 per cent of the sound value of the property insured. If the insured carries the required amount of insurance on each separate unit (detached building or contents of same) he collects the full amount of loss up to the value of the policy. In some cases the Average or Pro-Rata clause may apply because of blanket coverage. The difference between these two forms should be understood before using either one.

Concurrent insurance means that, when there is more than one policy covering the same property it is essential that all be written under the same name; the location and description of the property be the same; and all policies contain the same clauses. This is necessary in order that losses may be properly apportioned between the various companies carrying the risk.

Cancellation of policies is a right generally reserved by the insurance companies to exercise at any time by giving all parties named in the policy 5 da notice to cancel. When so cancelled it is on a pro-rata basis. If an insured cancels, the cancellation is usually on a short rate basis. However, in every case one should thoroughly understand the provisions of cancellation in each of his policies.

Change of ownership of property (except by death of insured) must be reported promptly to the insurance company.

Vacancy and non-occupancy clauses extend the normal limit of 10 da vacancy or unoccupancy, to 60 da on mercantile property, and to 120 da vacancy on residential property. There is no restriction as to time of unoccupancy on residential property. The policy should be endorsed if vacancy is to extend beyond these periods of time. The term vacant is construed to mean an empty building and unoccupied is construed to mean a building where operations have ceased, or, a dwelling that is partly or entirely furnished but where the occupants are temporarily absent.

Occupancy permit is designed to liberalize some of the incorporated provisions in the printed conditions of a policy. This grants the insured permission for use of the premises as is usual to the occupancy as conducted therein, and, to keep and use all articles and materials usual and incidental to the occupancies and in such quantities as needed. This clause is particularly desirable in policies covering against loss by fire.

Transfer or change of location must be reported immediately and the policy sent in for endorsement of change. A change based on the rate is made when the rate is higher at the new location.

Losses under all contracts must be reported. The insured is required to give immediate notice of loss to the insurance company or its agent.

Rebates on fire insurance policies, can only be allowed in cases where an owner or tenant has improved the risk from a fire protection standpoint.

Endorsements are changes to a policy and can only be made by the insurance company after request by the policyholder.

Summarizing, the restriction clauses of a policy are just as important as the coverage clauses to an insurance policy. They should be thoroughly understood before the policy is laid away, with the feeling that "all is well."

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[1] See What the Plant Engineer Should Know About Industrial Insurance. PLANT ENGINEERING. March, 1948, page 28

Maintenance and Checking of Fire Fighting Equipment

BY O. W. STEWART. *Manager, Inspection Department.*
Associated Factory Mutual Fire Insurance Companies

THE BEST fire protective system can be made useless by poor maintenance. For plant fire safety, the equipment must be kept ready, by the plant engineering department, to go into instant action when fire strikes. Management cannot afford the risk of not knowing if the protective system is in good order. That's why thorough weekly inspections by competent plant men are so important, and so strongly urged.

Highlights of a plant self-inspection are as follows:

1. Make certain all sprinkler valves are accessible, open and properly sealed. Test water-flow alarms by drawing water from the inspector's test connection.

2. Start fire pumps weekly to be sure they are ready for instant use. See that priming tanks and suction reservoirs are full. Be sure gravity tanks are full. In winter, keep the tank heating system in proper order.

3. Check dry-pipe valves for proper air pressure, water level, and other necessary maintenance items.

4. See that hydrants are accessible, wrenches available, and that hydrant barrels drain properly when not in use. Make certain that hose and other equipment in hose houses are in place and in good condition.

5. See that extinguishers are accessible, full, and in good condition.

6. Move fire doors to be sure they are not obstructed, that they operate freely, and are in good repair, with fusible links in place. Make sure scuppers and drains are not obstructed by stock or refuse.

7. Look for missing, disconnected, corroded or painted sprinkler heads, and for locations where the discharge from sprinklers would be obstructed by high piled stock, new ducts or new partitions.

8. Check and test safety devices on ovens, furnaces and on oil-fired, gas-fired, or other special hazard equipment.

WEEKLY INSPECTION OF FIRE PROTECTIVE EQUIPMENT

SPRINKLER VALVES
Check condition of valve as found

Valve No.	AREA CONTROLLED List both inside and outside valves.	Open	Shut	Sealed
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				
21				
22				
23				
24				
25				
26				
27				
28				
29				
30				

If sprinklers were closed since last weekly inspection, were red tags used?.....
Were valves reopened wide and sealed?.....
Was a good full-flow drain test made after each valve was reopened?.....

JAN. 1941

Plant.....Date.....

Location.....

Instructions to Inspector: Fill out this blank while making inspection. Do not report a valve open unless you personally have inspected and tested it. Every valve controlling sprinklers or water supplies to sprinklers should be listed. When the blank is filled out, it should be sent to your superior and held for review by the next Factory Mutual Inspector.

DRY PIPE VALVES:

No. 1. Valve room properly heated? ..... Air Press. ..... Alarms O.K.?.....
No. 2. Valve room properly heated? ..... Air Press. ..... Alarms O.K.?.....
No. 3. Valve room properly heated? ..... Air Press. ..... Alarms O.K.?.....
No. 4. Valve room properly heated? ..... Air Press. ..... Alarms O.K.?.....

WATER PRESSURE: .....lb. at yard level.

FIRE PUMP: Turned over and found in good condition? .....
Suction reservoir full? ..... Priming tank full? .....

SPRINKLER TANK: Full?.....Heating system in use?.....
Temperature at cold water return.....Circulation good?.....

HYDRANTS and HOSE EQUIPMENT: In good condition?.....
Nos. 1.....2.....3.....4.....5.....6.....7.....
Remarks.....

AUTOMATIC SPRINKLERS: Any heads missing?.....
Disconnected?.....Obstructed by high-piled stock?.....
Any rooms not sufficiently heated to prevent freezing?.....
How many extra heads available?.....

SPRINKLER ALARMS: Tested?.....In good condition?.....
Do not test hydraulic alarms when temperatures are below freezing.

FIRE PAILS, EXTINGUISHERS, SMALL HOSE:
In good condition?.....

FIRE DOORS and SHUTTERS: All inspected?.....
In good order?.....

ELECTRICAL EQUIPMENT: Any defects noted? .....
.....
.....

HOUSEKEEPING: Good throughout?.....
Combustible waste removed before night?.....

REMARKS on other matters relating to fire hazard.....
.....
.....

.....
Inspector.

PRINTED IN U. S. A.

This form was made up by the Inspection Department of the Associated Factory Mutual Fire Insurance Companies as a sample check list and was not intended to be suitable for every type of plant in every industry

The Simplification of Construction and Remodeling by

"Stud Shooting"

Installation of sprinkler system hangers and pipe hangers has been completed by this method in record time. . . . Conduit, lighting fixtures have been installed in recently-constructed buildings at savings to management and resulting ease of maintenance for plant engineering department. . . . Wall panels and other parts of modern buildings can be installed quickly and easily with a stud welding gun. . . . Remodeling for modernization can be completed with less fuss and muss

Fig. 1. Various types of sprinkler system hangers are shown in this photograph. Also pictured are studs which have been welded to sections of steel

UNTIL recently, sprinkler system installation in existing buildings has been one of industry's knottiest and most expensive problems. Interior finishes have been damaged extensively by the necessity of chipping out large openings to accommodate beam clamps and other hangers. With the introduction of automatic stud welding, not only have basic hanger costs been reduced but the plant owner and the plant engineer are assured that a minimum of damage will be done the structure.

The stud gun, made by Nelson Stud Welding Corp., has been found to be an extremely versatile tool. It can be used for fastening wall panels, installing lighting fixtures, putting up pipe hangers and conduit fastenings and for many other necessary chores of construction and remodeling.

Operation of the gun is the last word in simplicity: The operator can "shoot" studs in about one-sixth the time it takes, ordinarily, to drill and tap holes required for bolts. All he does is slip the desired stud into the gun through a little porcelain, washer-like ferrule, place the muzzle against the steel surface and pull the trigger. An automatic timing device does all the rest so that when he pulls the gun away an instant later the stud is left, securely fastened to the steel. In using the stud gun on remodeling work, where plaster or wood has been used to cover or conceal the steel beams, all that is necessary is to drill a small hole just large enough to permit insertion of the stud and ferrule at the exact point where the hanger connection is required

Cost Reduction

Reduction in costs of many installations have been reported. In one instance, the installation of more than 500 incandescent lighting fixtures on Q-panels which formed the ceilings for the first and second floors of a

● **INSTALLATION OF LIGHTING FIXTURES—The use of the welding gun in the installation of electric lighting fixtures is portrayed in these two photographs**

Fig. 2. The hole has been bored through the Robertson panels and one stud has been welded in place: the operator is attaching the second one

Fig. 3. Here the operator is running up the nuts on the stud and the lighting fixture is in place. This makes a total of three distinct operations

● **INSTALLATION OF ELECTRIC CONDUIT—Welders have all the enthusiasm of four-year-olds with a new popgun when they are handed one of the new stud welding guns**

Fig. 4. This welder is using the stud gun at the new Electronics Park project of General Electric Co. in Syracuse. Note that the mechanic is able to keep one hand free for support

Fig. 5. The electrician follows closely on the heels of the welder so that they work as a team in the installation of conduit. Pipe straps are bolted to studs to hold conduit

warehouse, was accomplished without the use of outlet boxes, grommets or lock nuts usually employed for this purpose.

The superintendent of construction for this project reported that this simplified method reduced installation time approximately one-half hour per outlet and saved approximately 65 cents worth of material per outlet.

For this type of installation holes are sawed in the steel flooring and, with the hollow channels of the flooring material serving as wire ways for the lighting circuit, the threaded studs are welded to the steel plates at predetermined points as shown in two of the accompanying photographs.

In the installation of conduit, the studs are welded into place, side by side, and then standard pipe straps are bolted to the studs to hold the conduit in place. There is a big saving possible with this type of installation over the conventional method of drilling and tapping holes for bolts and studs.

A number of other time and cost saving connectors have been developed by the manufacturers of the welding gun and many of these have already found acceptance in construction and remodeling work. They include "blind" fasteners for application of corrugated asbestos and other roofing and siding, for the hanging and fastening of all types of insulation, electrical systems and metal lath.

● **INSTALLATION OF PIPE HANGERS—Marked reduction in the cost and trouble involved in installing pipe hangers and sprinkler systems is another advantage of the gun**

Fig. 6. This craftsman is welding female studs direct to the structural steel to support pipe hangers which will carry miles of piping in the Ford assembly plant at Robertson, Mo.

Fig. 7. Here the mechanic is prepared to hang the pipe. The hanger is being screwed into place ready to adjust to proper length and the entire job is completed ready for use

Fig. 8. Below: Another photo taken at the Ford assembly plant. Shown here are workmen erecting 13-ft lighting panel boxes; twelve studs are required to secure these boxes to the column

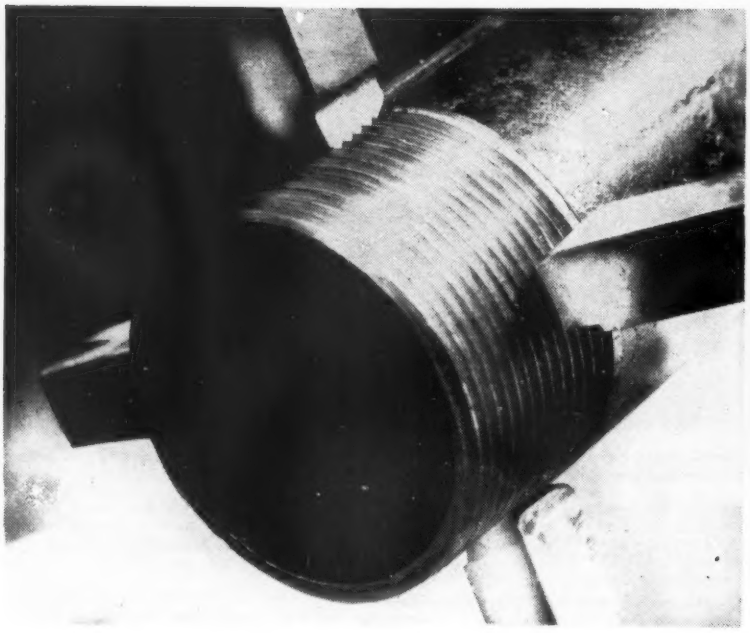

Fig. 1. To obtain a satisfactory and normal thread consistent with reasonable die life, the lip angle on hand tools is more conservative than it is on stationary pipe machines. This avoids excessive chipping at the points of the teeth. Lip angle should be modified from standard for pipe other than steel pipe

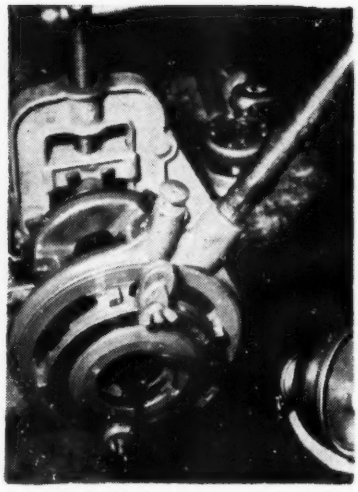

Fig. 2. Plenty of threading oil is a necessity for the proper functioning of hand tools. It helps to absorb the heat and save the dies. The oil can be strained and re-used

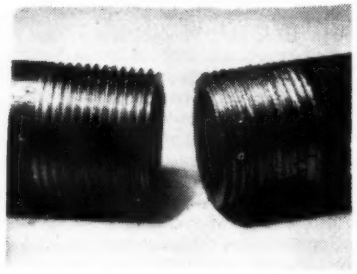

Fig. 3. Poor threads are a waste of time and material. Avoid the above condition by using sharp dies and good threading oil

CARE and USE of Hand Pipe Tools

By R. B. PEALER, *Chief Engineer, Beaver Pipe Tools, Inc.*

PIPE THREADING and cutting tools are make-up tools widely used in industrial pipe shops for plant maintenance. They are used on work which may range from repairs to new installations of water, steam, gas, air or electric conduit lines. Like any common-place tool, pipe tools must withstand a surprising amount of abuse and yet function when needed —this accounts for their simplicity of design — free from all unnecessary gadgets which could easily get out of order.

Many large users have a definite maintenance program for their pipe tool equipment. Tools returned from one job are given proper attention in the way of cleaning and oiling, new or reground dies and knives before releasing them again for the next assignment. This precaution is justified where time and material are large factors.

It is a foregone conclusion that the experienced craftsman has definite preferences about the type of pipe tools that best suit his purpose. As a consequence, the manufacturer of such tools has a wide, varied contact with users at large. He is often called upon to offer his assistance to aid the user in such problems as the threading or cutting of a particular analysis of tubing; torn or wavy threads; fine or double thread; lead-screw (threaded barrel) trouble, etc. In fact, voluminous paragraphs could be written on threading behavior.

Before describing the various types of tools, let us expose Pipe Tool Enemy No. 1—Poor Threading Oil, or the lack of any threading oil. In Fig. 1, we see a normal thread, with the segmental dies in their respective positions. Because of frictional contact between die teeth and thread, a means is necessary to effect heat dissipation. Some of the major complaints experienced by pipe tool manufacturers are: 1. Die teeth chip prematurely; 2. Die teeth weld shut; 3. Normal die but threads are torn. As a result, approved threading oil is made available to pipe tool users primarily as a service. By the increased use of this cutting oil, the above-mentioned difficulties have been greatly reduced—often eliminated completely. The user is not always conscious of the importance of using the right threading oil. In some cases he resorts to discarded crankcase oil, lubricating oil or no oil at all.

Accentuated graphically in Fig. 2 is the importance of a copious supply of good threading oil (lard-sulphur combination). This oil is of a clingy syrup consistency which does not run off readily and has a viscosity of about 150 Saybolt at 100 F (Sulphur increases the cooling action). When oiling by hand, a flood of oil placed at the start, and again at the middle of the cut, should be sufficient.

Shown in Fig. 3 is a comparison between two threads cut with the same dies, one with a flood of proper threading oil, the other with a poor oil.

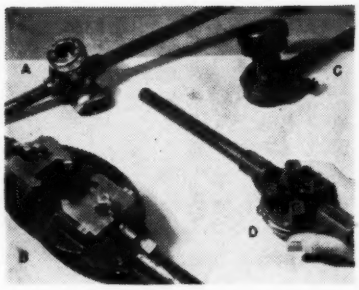

Fig. 4. Four types of non-receding threaders. All have full-width dies

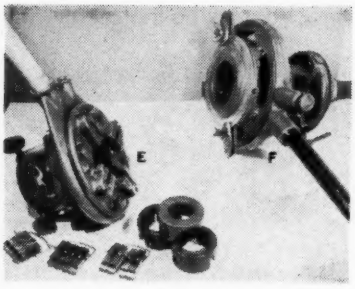

Fig. 5. Two representative types of receding threaders with half-width dies

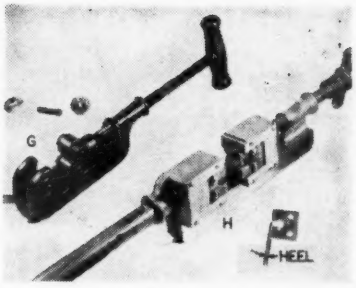

Fig. 6. Two types of hand cutters, wheel and roller type; a knife cutter

It is hoped that this accentuation of the importance of an approved threading oil will sufficiently impress the pipe tool user to encourage its use. The cost will be repaid by the savings in tool repairs, replacements, recutting bad threads and refitting leaky joints.

A description of representative types of tools, their care and use follows. To facilitate the discussion we will divide the threaders and the cutters, each into two groups: 1. Threaders with receding dies; 2. Threaders with non-receding dies. 1. Cutters of wheel and roller type; 2. Cutters of knife type.

Four representative types of non-receding threaders are shown in Fig. 4. All of these tools have one point in common—full width dies. Die width equals the length of thread. At A is shown a 3-way stock, a tool having three sizes. The popular drop-head tools are shown at B; neither of these tools is adjustable. At C and D are two types of adjustable tools. Adjustment of C is obtained by moving each of the two quadrant blocks an equal amount. In D all segments move automatically an equal amount by turning a knurled cam as shown.

Two representative types of receding threaders are shown in Fig. 5. Here the die segments are roughly half-width dies. The smaller section reduces frictional contact, taper of thread being obtained by allowing the die to gradually move away from the thread at each successive turn, thereby performing the work with less effort. At E is shown what is known as 4-poster tools, where one set of dies is used for each size of pipe. Some models use separate bushings, others have universal workholders. At F is a completely self-contained tool having one set of dies to cover the range of sizes, each die receding as described above. This type usually always has a universal workholder. Also this tool is fully adjustable for undersize or oversize threads without affecting thread length. In the unit at E thread length is slightly disturbed in effecting the same adjustment. Both types are very acceptable tools.

Two well known types of hand cutters are shown in Fig. 6. At G we have the wheel and roller type—showing the usual renewable parts (cutter wheel, pins, rollers). This cutter will cut off small rods usually up to ⅞ in. as well as pipe up to 2 in. Its cutter wheel is replaceable at low cost making it popular as an all-round tool within its range. At H is shown the knife cutter and its type of knife. Some types, however, use a straight blade. The knife shown has an offset heel to govern the depth of cut to prevent hogging. Knife cutters are used extensively on conduit where a square cut without upsetting is important. Also for grooving and beveling pipe.

The cutting edges of pipe tools are about the only parts that need careful attention. It is good practice, therefore, to have on hand at all times extra sets of dies, knives or cutter wheels. Dies are probably the most critical since the end use of the tools is good threads. When inserting dies into the tool see that die slots are clean and that No. 1 die goes into No. 1 slot, No. 2 in No. 2 slot, etc.

The following suggestions are offered on die grinding: In Fig. 7, I represents a properly ground die. The lip angle X varies somewhat on different dies, and is determined by the manufacturer as a result of many years of experience. The X angle is governed by two factors: The material to be threaded and the life of the cutting edge. When the user attempts regrinding, care should be used to maintain the approximate X angle (lip angle) and to make all segments of one set the same. If grinding is done before the die becomes rounded at the points—only a few thousandths of an inch need be removed to restore its razor edge. This operation is illustrated in Fig. 8. If a die segment has a chipped tooth as at J, Fig. 7, this segment can be salvaged by grinding out the offending tooth. See Fig. 9. Tooth chipping may result from too much lip angle, too little threading oil, a seam or hard spot in the pipe. A die which fills up with stickers as in K, Fig. 7, must be discarded and replaced.

The above-mentioned points on die grinding are intended for repair and salvage of dies which might otherwise be scrapped. Where a new job of piping is started all tools should be inspected and new or resharpened dies put into the threading tools.

The popular wheel-and-roller cutter is used not only for steel pipe but is also adapted by interchange of wheels to cut off brass pipe and cast iron pipe. This tool literally squeezes the material apart as it cuts. For this reason, wheels should be as thin as practicable to avoid upsetting in the softer

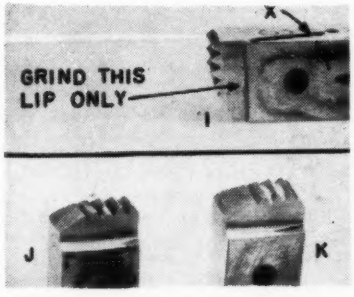

Fig. 7. The suggestions on die grinding, in the text, are illustrated here

Fig. 8. The proper method to follow in die grinding is pictured above

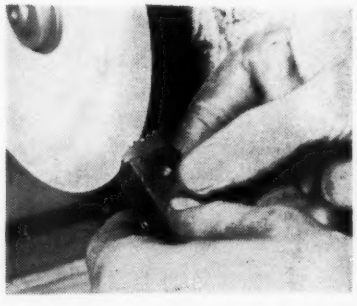

Fig. 9. A die segment with a chipped tooth may be restored by grinding

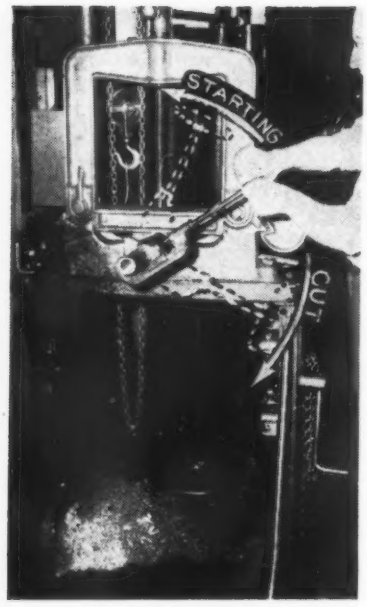

Fig. 10. A cutting tool should first be rocked to start the cut; then revolve it

materials. The user of this tool needs no cutting oil. When the tool is in position for cutting, a straight cut can be insured by first rocking the tool in an alternate forward and backward motion, see Fig. 10, thereafter revolving the tool in a straight line until the cut is finished. Occasionally some wheels are broken by attempting to pry sidewise to hasten the final cut; this practice may ruin the wheels. Cutter wheels are never resharpened; extra wheels should be kept on hand as spares.

Table I. Use and application of threaders and cutters

Tool	Type	Range Inches
Threaders	Drop-head	⅛- 2
Threaders	3-Way	⅜- 1
Threaders	Receding	1-12
Cutters	Wheel, Roller	⅛-12
Cutters	Knife	⅛-12

Knife cutters, unlike wheel cutters, need plenty of cutting oil and sharp edges. A dull knife will either glaze over the cut or break when under feed pressure. The care of knife cutters in general can be the same as for threaders, since they are both cutting tools. The larger sizes of threaders and cutters are in the form of geared tools. They have sufficient leverage to be operated by an auxiliary hand ratchet as shown in Fig. 11, or by an auxiliary drive shaft interposed between tool and portable power drive, as shown in Fig. 12.

Generally speaking, geared tools have much more bearing area than their smaller counterparts, and therefore subject to less wear. Their bulk is added protection and unless they are inadvertently dropped upon a cement floor their life extends over many years. Sharp dies and knives, together with lubrication, are the fundamental necessities. There is one further point which is common to all receding tools and is next in importance to cutting edges. Attention is directed to the lead screw, commonly called the threaded barrel. The function of the lead screw is to pull the narrow receding dies on to the work and maintain proper thread pitch. Since the lead screw is an exposed element it is subjected to wear by fine cuttings from the dies and from other foreign matter. The bottom edge of the barrel has an offset, called a half-thread, which acts as a cleaner for the female thread in the work-holder. If this point becomes fouled the tool should be disassembled by unscrewing, washing the threads of both parts with a suitable cleaning fluid and removing any cuttings lodged in the thread. After this, re-oil and assemble. Should the lead screw become worn to the point of replacement it is likely its mating thread is also worn. If this happens both parts should be replaced as an assembly.

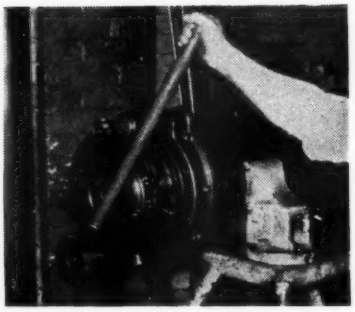

Fig. 11. The larger size tools may be operated by an auxiliary hand rachet

Table I illustrates the use and application of hand pipe tools.

Drop-head tools are usually found in every tool kit and are used for steel pipe, brass pipe, conduit and solid rods up to ⅞ in. The user changes head units instead of die sets; they have the convenience of a socket wrench set. Three-way threaders are handy combination tools—they are self-contained and are used extensively for conduit.

Receding threaders facilitate fabrication of a complete job by providing portable tool equipment up to 12 in. on-the-job at less cost and greater convenience over trips made to and from a distant pipe shop.

Knife cutters are used: (a) where an absolutely square cut is needed, free from fins—as in conduit work; (b) where a beveled end is needed preparatory to welding; (c) where pipe is to be grooved for slip couplings.

Fig. 12. A power drive is an indispensable adjunct to hand and geared tools. Hand tools, in effect, become power tools. The pipe shop then goes to the job with a resulting increase in production and reduction of worker fatigue

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UNSUNG MEMBERS of the electrical manufacturing industry who contrive such unglamorous, if vital, items as connectors, fittings or lugs report they are quite as much in step with the age of magic.

Cited as a case in point is the splicing of wires. Among developments simplifying this task, on which almost everyone has tried his hand at one time or another, is a bronze connector protected with a heavy-duty plastic insulator. Once bared wires are placed in each end, all that is necessary is a single squeeze on the installing tool, and, presto, the wires are permanently connected and insulated.

The How and Why of Steam Trapping

Part IV. Steam trap efficiency and efficiency factors . . . Test setups for determining thermal efficiency . . . Method of running tests and calculating results . . . Cost calculations for steam blowing

By H. G. EBERT, *Yarnall-Waring Co.*

STEAM TRAP EFFICIENCY is a very controversial and loosely defined term. There are several factors bearing on trap efficiency and some of them are frequently neglected in its determination. Furthermore, the two most important factors are almost diametrically opposite in scope and direction and their proper correlation into a single formula for trap efficiency, if at all possible, has not yet been successfully attempted according to the data available to the writer.

Most frequently considered of these two factors is the effectiveness of the trap in preventing the passage of live steam. The other is the ability of the trap to clear the apparatus of condensate as soon as it appears. If trap efficiency were to be based on the former consideration alone, a tightly closed valve would have an efficiency of 100 per cent. Its condensate drainage efficiency would, however, be zero. An open valve or steam trap would, conversely, have a trapping efficiency of zero and a drainage efficiency of 100 per cent. Obviously, from a practical standpoint, it is necessary to consider the matter of trap efficiency in the light of both of the foregoing considerations.

If it is desired to determine the thermal efficiency of a steam trap through actual tests, such tests should preferably be run with the trap actually in operation on the apparatus it is to drain, since the character of the apparatus, the piping arrangement, location, etc., provide the basis for proper efficiency determinations. Trap efficiency should be based on the normal enthalpy values of the condensate as determined by actual working conditions rather than a hypothetical set of conditions produced on a special test set-up. If, however, a laboratory test set-up is so arranged as to reproduce actual working conditions for a given piece of equipment, the only deterrent to its actual use is the cost of preparing it.

Figure 17 illustrates an apparatus for determination of the thermal efficiency of a steam trap. In tests run with this arrangement the thermal efficiency is determined by measuring the increase in heat content of the water in the weighing barrel during the run. An increase in heat greater than would be accounted for by the amount of condensate added to the barrel during the run would indicate the presence of live steam in the trap discharge and would show a thermal efficiency of less than 100 per cent.

Provision should be made for location of a thermometer and an accurate pressure gage in the line just ahead of the trap inlet. The trap discharge line is run into and within 2 or 3 in. of the bottom of a standard size barrel placed on a platform scale and filled half full of cold water. A thermometer is suspended in the water which must be stirred continuously during the test and various other valves and accessories as illustrated in Fig. 17 will be found to facilitate the efficient and accurate running of the test.

The test run should be of such duration that the temperature of the water in the weighing barrel will be about as much above room temperature at the conclusion as it was below room temperature at the start. In this way the effect of radiation is eliminated if the rate of temperature rise of the water is constant.

At the beginning of the test simultaneous readings of weight and temperature of the water in the barrel, steam pressure and temperature ahead of the trap and the time should be taken. The same readings are taken at the end of the run, and from this data the thermal efficiency may be computed, as illustrated in the example in the table. Maintenance of constant steam pressure and temperature throughout the run will greatly simplify the computations.

For the purpose of this example it is assumed that the condensate leaves the apparatus at steam temperature. This condition may be obtained with a laboratory test set-up but with actual working conditions it would be an exception rather than the rule since a certain amount of sub-cooling of condensate is nearly always to be expected. With the introduction of suitable factors into the equation given in the example, thermal efficiency may be determined with sub-cooled condensate. However, the computation becomes more cumbersome and care must be taken to obtain an accurate average of temperature of the condensate handled by the trap.

In the example, factors are introduced to cover the radiation losses of the traps tested. The purpose of this is to show the relative effect of these losses on thermal efficiency. The trap being tested must not be insulated if it is of a type dependent on a certain amount of radiation loss for proper operation. Such a loss must be considered in the overall results of a test made with sufficient accuracy to per-

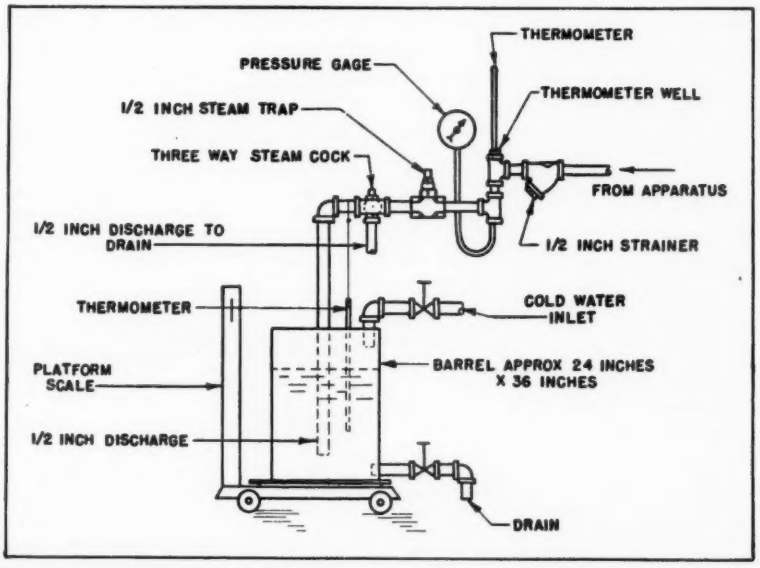


Fig. 17. Arrangement for trap testing and condensate measurement. Date and calculations are covered in the text

mit inclusion of the small percentages involved.

Calculations and data for a typical trap test

Data for the Example

Steam pressure at start, psia	115.0
Steam temperature at start, F	338.0
Steam pressure at conclusion, psia	115.0
Steam temperature at conclusion, F	338.0
Room temperature during test, F	75.0
Water (in barrel) temp. at start of test, F	50.0
Water (in barrel) temp. at end of test, F	100.6
Weight of water in barrel at start, lb	260.0
Weight of water in barrel at end, lb	320.0
Duration of test hr	1.0

Computations:

Total condensate discharged=W
=320-260=60 lb

Enthalpy of saturated vapor=E_s
=1189.1 Btu (from steam tables)

Enthalpy of Evaporation=E_v
=880 Btu (from steam tables)

Enthalpy of water at start=E_1
=(50-32)×260=4680 Btu

Enthalpy of water at end=E_2
=(100.6-32)×320=21952 Btu

Radiation loss of piping*=R
=5½×210=1155 Btu

From this data the thermal efficiency E_t of the trap may be taken as

$$E_t = \frac{W \times E_s - (E_2 - E_1) - R}{W E_v}$$

$$= \frac{60 \times 1189.1 - 17272 - 1155}{60 \times 880} \times 100$$

$$= \frac{52681 \times 100}{52800} = 99.8 \text{ per cent}$$

*Radiation loss for ½ in. pipe at 338 F is interpolated from Kent's handbook as equal to 210 Btu per linear foot per hour and 5.5 ft of pipe are assumed. Heavy lagging of the pipe and barrel will improve the accuracy of the test and eliminate this factor.

Since the trap under test has an exposed surface of 0.152 sq ft which, at 115 psia and 338 F, radiates heat at the rate of 780 Btu per sq ft per hr making a total of 0.152×780 or 119 Btu this heat loss prevents it from operating at 100 per cent thermal efficiency. Note that if this loss is preventable and unnecessary to the operation of the trap in normal service there will be an increase of 119 Btu in the final enthalpy of the water in the barrel and the value of E_t becomes:

E_t=52800×100/52800=100 per cent

In either case there is no direct loss of live steam. If an inverted bucket trap of similar capacity but inherently requiring radiation of heat for its operation, were submitted to this test the radiation loss would be 0.961 sq ft x 780 Btu per sq ft per hr or 760 Btu. Without live steam leakage its thermal efficiency would be:

E_t=(52800—760)×100/52,800
=98.6 per cent

or approximately 1.2 per cent lower than the trap with the smaller radiating surface.

Now let us assume that with all other conditions as in the above test the temperature of the water at the end of the test is 115 F instead of 100.6 F. Then the actual enthalpy at the end of the test would be

(115—32)×320=26560 Btu

and

E_t=48311×100/52800=91.6 per cent

indicating loss of heat due to passage of live steam. The amount of live steam lost would be the difference in enthalpy between the latter and the ideal (first test) condition, divided by E_v, is

(26560—21952)/880 or 5.24 lb per hr

Except in the case of a trap blowing large quantities of live steam the condensate drainage efficiency previously mentioned is perhaps more important than the thermal efficiency. This is especially true in heating and process equipment where the quantity and rapidity of heat transfer is most important. A trap which may be saving its operator a few cents per day through its high thermal efficiency may well be wasting many dollars due to its inability to remove condensate rapidly and continually, thus greatly reducing the operating efficiency of the apparatus being drained.

The foregoing thermal efficiency computation assumes a trap with a thermal efficiency of 91.6 per cent in the second case. This trap is passing 5.24 lb per hr of live steam. Let us say that this particular plant burns coal containing 13,000 Btu per lb and costing $6.00 per ton on the grates. The boiler efficiency is 70 per cent and the trap is in operation 8 hr per day. Steam is being generated at 100 psig and requires the addition of 1151 Btu for its generation. This is 1188.9 Btu from the steam tables less 37.9 Btu already at 70 F feedwater. The cost of the steam lost by the trap is

$$\frac{5.24 \text{ lb/hr} \times 8 \text{ hr} \times 1151 \text{ Btu} \times \$6/\text{t}}{2000 \text{ lb/t} \times 1300 \text{ Btu/lb} \times 0.7 \text{ (Blr. Eff.)}}$$

=1.6 cents per day

Many factors other than abstract efficiency and steam cost figures enter into the selection and continued use of a steam trap as outlined[1] earlier.

[1] See Part III of this series, PLANT ENGINEERING, May 1948.

Better Tests for Lock Washers

By H. GREENBERG. *Westinghouse Electric Corp.*

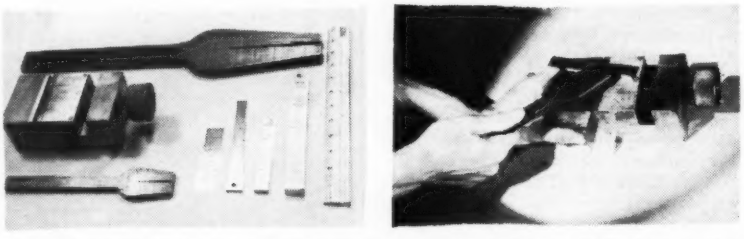
APPARATUS that gives correct and reproducible results superior to the SAE "vise and monkey wrench" method for torsion testing of lock washers has been developed. The SAE testing procedure leaves much to be desired as far as uniformity of test method between operators and duplication of results is concerned. The variables are: 1, percentage of washer not included between the jaws of the vise; 2, exact angle through which the washer is twisted before fracturing; and 3, grip of the monkey wrench on the washer.

We have eliminated these variables by the use of a specially designed vise with a built-in protractor, special wrenches, and two sets of gauges. These gauges are calibrated for different sizes of lockwashers. One gauge fits in between the jaws of the vise so that the lockwasher can be placed on the appropriate step. The other gauge is placed on the level corresponding to the diameter of the washer.

This leaves the exact prescribed circumference of the washer free for twisting between vise and wrench. The angle at which failure occurs can be readily determined from the protractor scale on the vise.

New testing apparatus has been used for the last 2 yr for the routine inspection of all lockwashers received in the Westinghouse East Pittsburgh Works. During this time, we have experienced no questioning by suppliers of the validity of our test and rejections have been accepted without argument. In addition, this equipment is used for the torsion testing of lockwashers after electroplating to ensure us that the washers have received the stress relief treatment for hydrogen embrittlement which often accompanies plating.

*1946 SAE Handbook, p. 693



Apparatus used for improved lock washer torsion test (left) and (right) a washer in the process of being tested. The improved test. now in use two years has eliminated argument over rejections and serves as a valid check on stress relief treatment

Questions and Answers

Answer to

Effect of Voltage, Frequency Changes

HOW DOES changing the voltage and frequency affect the operation of an induction motor — provided these changes are, say, in the neighborhood of 10 per cent? D. H.

IN GENERAL AN increase in voltage and a decrease in frequency have opposing effects. For instance, a 10 per cent increase in voltage and a 10 per cent decrease in frequency would result in about normal operation except for the change in speed which is directly proportional to the frequency.

Generalizing still further, and assuming a 10 per cent variation in voltage or frequency for constant horsepower output the following effect would be obtained.

A. Starting torque and pull-out torque will vary as the square of the voltage and inversely as the square of the frequency.

B. Full load torque will vary inversely as the frequency.

C. The starting turn will vary as the voltage and inversely as the frequency.

D. Efficiency and power factor are not greatly affected by the change in either voltage or frequency.

The accompanying table published by the National Electric Coil Co. shows a tabulation of voltage and frequency variation effects. The tabulated values are variations from normal operating characteristics, plus the notes of increase, minus the notes of decrease. The changes in operating characteristics due to a 10 per cent increase in voltage can be read in the first column under voltage variation plus 10 per cent. Voltage or frequency changes which fall within the ranges shown can be obtained by interpolation.

Effect of small voltage and frequency variations on induction motor characteristics

Characteristics	Voltage Variation		Frequency Variation	
	+10%	—10%	+10%	—10%
Synchronous RPM	0	0	+10%	—10%
Slip	—15%	+15%	0	0
Core loss	+8.2%	— 8.5%	+8.2%	— 8.5%
Primary Copper loss	—14%	+22%	0	0
Secondary Copper loss	— 2%	+ 3%	0	0
Friction and windage	—slight	slight	+slight	—slight
Starting torque	+20%	—20%	—20%	+20%
Pullout torque	+20%	—20%	—20%	+20%
Power factor	— 3%	+ 1%	+slight	—slight
Starting current	+10%	—10%	—10%	+10%
F. L. Current	— 7%	+10%	—slight	+slight
Efficiency	— 1%	+ 1%	+slight	—slight

Answer to

Wasting Light to Save Money—

S. S. stated that every morning it took the entire maintenance force to answer the complaints about the fluorescent lighting in the office area in his plant. He said that this caused a great deal of general dissatisfaction and also interfered with their other work.

REGARDING the fluorescent lighting troubles of S. S., I thought perhaps I might be of some help. I have worked on the maintenance of fluorescent lights for several years and am at present employed in a plant where there are about 6000 fluorescent lights.

When the lights are grouped in the offices, we use toggle switches; individual lights are switched by McGill 6 amp Levolier switches. Where it is possible, the switch should be installed so that the string pull will be straight down. This switch is small, compact, and has an unusual length of service because it trips easily on the pull.

For starters we use G.E. magno instant starters instead of the "Watch Dog" starter. This cuts down the work of pushing starter puttons in hard to reach places. All that the maintenance man has to do is to watch for "blinkers," or tubes getting bad on the ends. A blinking light, if replaced immediately, will keep the starter from burning out. A dark light doesn't always indicate a bad tube; try a new starter.

If a new tube should happen to have a flicker on the end, or along the entire length, turn the tube end for end. Most of the time this will clear up the trouble. Turning it in the lamp holders also clears up the trouble at times. Loose lamp holders are responsible for a lot of trouble.

We have found that leaving lamps burning continuously all day cuts down on maintenance. The amount of current used is far less than the cost of new lights. I have watched this over a period of years and find that it pays off.

Make sure that all wire connections are in their proper places and solder as many places as possible. A wire in the wrong place will cause trouble as long as it remains there.

I hope that these comments will be of some value to S. S. or another fellow worker.

Centerville, Ind. M. L. WHITTAKER

Answer to

High-Speed-Conveyor Operation

R. B. stated that they had installed a rewound 17 hp 970 rpm d-c shunt wound motor in a bucket conveyor recently, and that when the electrician threw the starting switch, it traveled so fast that the buckets were just a blur. They changed the connections, and then it ran backwards! The third time it was okay. R. B. wanted to know what made the motor go so fast.

THE ELECTRICIAN failed to connect the field terminals of the shunt motor to the line, and this caused the motor to run away. The speed of a d-c motor is inversely proportional to the magnetic flux developed by the field, and the flux is roughly proportional to the field current. Thus, when the rotor was energized but the field was not, only a very small magnetic flux known as the "residual flux," was present. This residual flux remains in the field poles after the power has been disconnected.

The reason for this seeming speed-vs-field current paradox is that the motor must, by the Law of Conservation of Energy, act as a generator while being driven as a motor. As a generator, it sets up a "back or counter emf" which opposes the line voltage and limits the rotor current to the amount necessary to do the shaft work and to overcome the friction and other losses in the motor. The voltage output of a generator depends upon two factors—the speed of rotation, and the magnetic flux developed by the field. Thus, when the rotor was energized with only the residual flux present, it had to turn at an astronomical speed in order to develop the required back emf. This also accounts for the fact that when a rheostat is

placed in series with the field of a d-c motor, *increasing* the resistance *decreases* the field current and *increases* the motor speed.

A runaway motor is an extremely dangerous piece of equipment, since the rotor is liable to explode violently because of the extremely high centrifugal forces. For this reason a shunt motor should never be used unless permanently connected to the load.

When connecting a compound-wound d-c motor the polarity of the two fields must be checked carefully in order to avoid opposing magnetic fluxes or "differential compounding." The resulting flux will be very small if differentially compounded, and the motor will run away. Follow the manufacturer's instructions carefully, and if there is any doubt, connect each field separately for an instant and be sure that they both turn the rotor in the same direction. Both fields will be of the same polarity, and the connections can be made permanent. The motor will then be "cumulatively compounded." If it is desired to change the direction of rotation, the rotor leads should be interchanged, and the field leads should be left alone.

LaGrange, Ill. P. E. KAVANAGH

Maintenance and Operation

Operators True Own Wheels

OPERATORS AT GE's West Lynn Works are saving valuable production time by truing their own grinding wheels with a fine carborundum, ¼ in. in diameter. An old collet, modified to fit a jeweler's lathe, is used. The

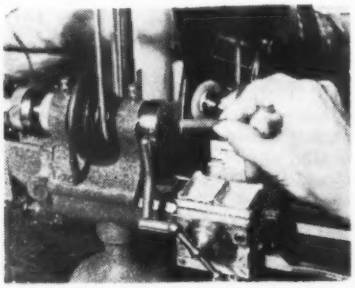


Fig. 1. Trueing a grinding wheel in a lathe with a fine carborundum stone

stone is inserted in the jaws of the collet and the grinding wheel is brought forward into truing pisition. This method saves time previously spent by a set-up man who had to remove the wheel from the operator's machine and grind it on a separate piece of equipment.

Post Puller from Axle

By G. W. KRUSE

IN ORDER to make the post puller illustrated we used a front axle from a scrap automobile and inverted it. The axle was cut in two in the middle and a piece removed. This allowed the two wheels to be brought together, separated by about 2 ft of the axle. The axle was welded together by splicing with steel plates.

Next, a piece of 2 in. pipe was welded at right angles to the axle as shown in the sketch. When using, the device is pushed up to the post to be pulled, the handle is raised and the chain wrapped around the post. The turns of the chain around the post are made from the bottom of the post upward. When the handle is pulled down to the horizontal out comes the pole.

Nuts to Cylinders

WHAT LOOKS LIKE a disembodied being or the man in the iron mask is really an operator in the huge new "push-button" airline maintenance base at San Francisco. The photo is good evidence of some of the advanced thinking, planning and acting that takes place in this ultra-modern plant built by Austin Co. for United Air Lines.

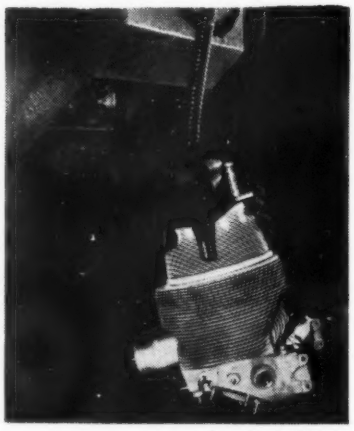
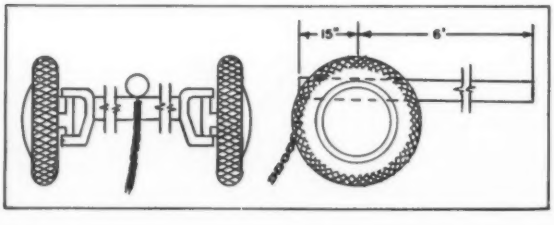


Photo: United Air Lines

A new use for walnut shells has been discovered at United Air Lines' San Francisco maintenance base. The finely ground shells are sprayed against cylinders of compressed air. These finely ground shells have been found to be less abrasive for cleaning purposes than sand which is usually employed



At the left is the post puller which was made from a scrap automobile front axel

Bracing Stator End Windings

ACROSS - THE - LINE starting sudden excessive loads and direct short circuits impose severe shock on the windings of electric motors and generators. To withstand these forces and to prevent insulation breakage and cause distortion, the end windings must be carefully braced.

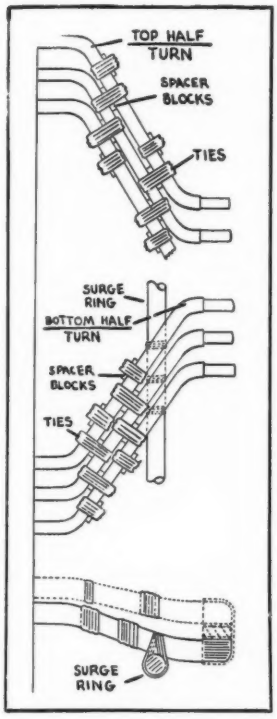
The method of tying or bracing is dependent upon the physical shape of the coil or winding and upon the design of the surge ring or rings, as well as the supporting brackets. As explained by National Electric Coil Co., the service duty of the machine determines the design and number of surge rings, and they in turn determine the number of ties per coil.

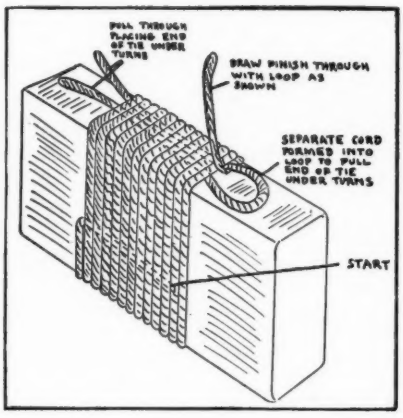
Figure 1 shows the scheme used for a half turn diamond type coil having only one surge ring as a support. Note that the bottom half coils are lashed and that each coil is tied in two places, rigidly affixing it to the adjacent coils.

As the tying progresses from one coil to the other, they become a network which rigidly binds the entire end winding. Spacer blocks of canvas-base bakelite or similar material are used between coils at the places of tying. The top-half coil is similarly tied, but not to the surge ring.

Figure 2 shows the start and finish of a single cord tie, while Fig. 3 shows the start and finish of a double cord tie. The needle can also be used in the method described in Fig. 2 and the separate loop of cord eliminated.

Glass cord and flax cord are both used for making ties. Glass cord is normally available from the usual suppliers as untreated, treated with a light coating of wax, or treated in Neoprene. National has had the best




PULL THROUGH PLACING END OF TIE UNDER TURNS
DRAW FINISH THROUGH WITH LOOP AS SHOWN
SEPARATE CORD FORMED INTO LOOP TO PULL END OF TIE UNDER TURNS
START

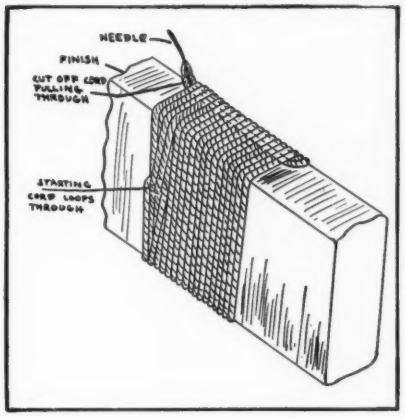


Fig. 1. Left: Shows a method of tying end windings of a half turn, diamond type winding. Note the bottom coil is lashed to the surge ring, and to adjacent coils so that the tying progresses from coil to coil. This results in a rigidly braced winding. Spacer blocks maintain a uniform gap for ventilation and are essential to making a solid end winding

Fig. 2. Center: A single cord tie is commonly used and the start and finish are anchored down as shown. The start is folded under the required number of ties and the finish is pulled under the ties by the use of a loop. This is then pulled taut and the cord cut off

Fig. 3. Right: Shows a double cord tie often used on larger equipment. A loop is made by tying the ends of a single cord together and then the first turn of the tie is fed through and folded back on itself. After the number of ties are made, the finish is fed under the ties with the needle, pulled through taut, and cut off

results by vacuum pressure impregnating untreated glass cord with a long-life, flexible, slow-baking varnish, and semi-curing it prior to application as tying cord.

The varnish impregnation imparts appreciable abrasion resistance to the cord by coating each minute fibre. This also prevents moisture from being entrained between the thousands of small glass filaments. Some users prefer glass cord instead of flax cord not only because of its better heat-resisting qualities, but because it has been found to be more mechanically stable over longer periods of time.

Flax cord has been the standard material for many years. For the usual job, it is entirely satisfactory. It is easy to use, does not require preheating and is relatively inexpensive. If thoroughly saturated with varnish after application, it will last many years.

Crane Trouble Shooter's Puzzle

By H. B. McDERMID

AN ELECTRICAL repair man was called to go out to "shoot trouble" in a steel firm's big storage room in one of our larger cities. While being briefed for the job he learned that the crane he was to inspect was one of two serving the big warehouse room. They were equipped with two trolleys, each carrying a main and auxiliary hoist, with the intent that long limber loads of steel could be handled readily by using the two hitches. He also learned shortly after arriving at the job that nearly every repairman in town had had his chance at the trouble on this crane. It had always had queer balky spells while its twin, installed at the same time, had operated perfectly. The plant engineer had gotten so riled-up at the job that he believed all trouble shooters were fakes. Many had either given up on the job or had not made any progress toward finding the real trouble with the crane.

Questioning the crane operator, the repairman found that the crane behaved in a most puzzling manner. Sometimes all the motors would run perfectly—at other times not a motor would move a revolution. Any combination of the two situations might exist, seemingly at any time and without any reason that could be discovered. The crane operator went to the good crane and left the stranger alone with the tricky machine. Checking the operation, our man found it just as represented. Almost any combination from full and perfect operation to a complete stall on all motors could be gotten, but no logical reason for the changes could be detected. Finally at a complete loss as to what next to do, he phoned his boss for another man to test out all circuits with him, but privately had decided he must join the ranks of the fellows who could not locate and fix the trouble. His boss told him over the phone that it would probably be two hours before he could get him a partner, so our hero sat down where he could see the side of the crane which bore the group of parallel feeder wires that fed the crane's motors. He started to study the job over again. He noted the two trolleys or sets of hoisting drums, each with their row of collector wheels running on the feed wires and realized how closely to the same height those collector wheels would have to be set so that one trolley would not lift the feeder wire off the other's collector wheel as they approached each other on the bridge.

Climbing to the catwalk, he checked the height of the collector wheels on two trolleys which ran on the same feed wire. While these should have been adjusted to the same height, he found them very different. Cancelling his call for an extra man he adjusted all the collector wheels so the ones on the same feeder wire as near the same height as he could get them. When the whole set was in what appeared to be perfect adjustment, he again tried out the operation at the controls. This time he found that there was no combination of positions in which the crane would not operate perfectly. Upon reporting to the plant engineer, he got a hard-boiled expression of complete doubt, and a statement that the crane would be thoroughly tested before anyone there would accept his O.K.

After two weeks in which the crane was used constantly without a bobble, he got the satisfaction of a complete endorsement of his job. Sometimes the answers to these problems are obscure indeed before they are found but seem ludicrously simple when they are found. Perhaps the man who placed this crane had not installed a two trolley outfit enough times to be on his guard about this detail of adjustment.

Plant Engineer's Digest

Separating Tin Plate Sheets

A NOVEL, simple, and inexpensive solution to a costly production problem was recently announced. The problem: To separate thin sheets of tin plate in order to remove them quickly from stacks containing a large number of sheets.

The solution: One or more magnets placed along the edge of the sheets. The magnets caused the sheets to become like magnetic poles and repel each other thus separating the sheets slightly.—*From the Ohmite News, a publication of Ohmite Manufacturing Co., Chicago.*

Painting Treated Knotty Lumber

ECONOMY LUMBER is a trade name of low grade lumber which contains live knots. These knots are intergrown with the surrounding wood fibers and never loosen, but do exude pitch and volatile substances that destroy a paint film.

Over two billion board feet of knotty lumber grades are produced annually in the western pine region of the United States. Approximately one-third of this total is used as the economy grade. The Western Pine Association conducted extensive research to solve the problem of sealing these knots and recommends a formula containing Bakelite and Vinylite resins.*

In application, the sealer is brushed over the unprimed knots and the surrounding area. The coats of paint are then applied in the usual manner. For repainting, all paint is scraped from knots or pitchy sections to be coated with the sealer before application of the new coat of paint. *From the January 1948 issue of Bakelite Review, a publication of the Bakelite Corp., New York, N. Y.*

*Paint and varnish dealers marketing this product will be supplied upon request by the Editor.

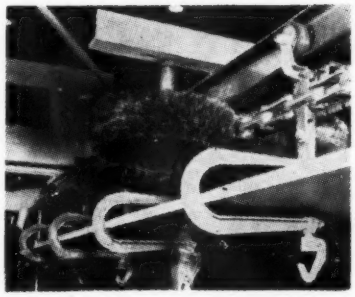
Brushes Descale Conveyor Chain

A UNIQUE power brushing technique now in use reduces conveyor-chain maintenance costs and offers substantial savings in operating.

The brushing setup, which operates in conjunction with one plant's new conveyor assembly, is designed to eliminate the problem of scale deposits on the conveyor chain, which passes through a rust-proofing solution at one stage of the assembly.

Two circular wire brush sections of special design are mounted on opposite sides of the conveyor chain, as shown in the photograph, to contact it just after it emerges from the bonderizing bath. Not only the scale deposits are cleaned off, but also excess grease, oil and dirt which accumulate in regular service.

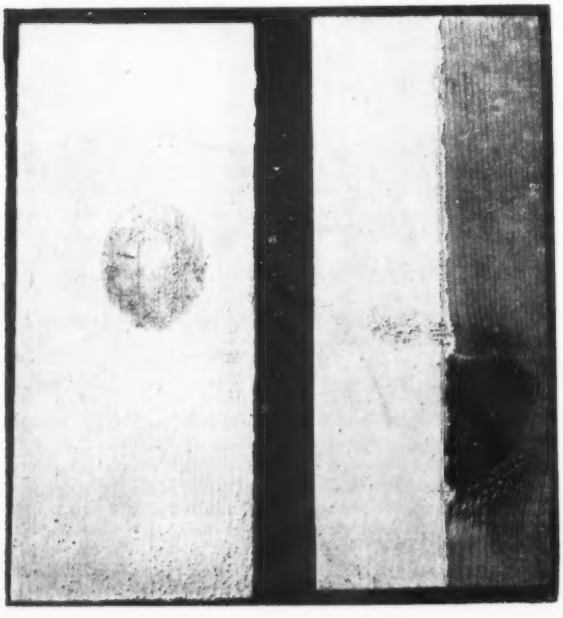
The plant's conveyor chain is one of the longest in the country and travels at the rate of 27 fpm. Prior to the introduction of the brushing method of descaling the chain, it was necessary to halt production periodically, remove the chain from the conveyor, and clean it in caustic solution.



This brushing installation, consisting of disc-center circular wire brush sections, keeps conveyor chains free of scale deposits, excess grease and dirt

The flexibility of power brushing enables it to meet almost any cleaning problem and it can be set up to eliminate the stopping of production while this necessary cleaning is completed.

One of the unusual features about this brushing operation is that no special power mechanism is required to operate it. The brushes revolve with the chain, cleaning it continuously as the production line moves.—*From the General Electric Review, a publication of General Electric Co., Schenectady, N. Y.*



Paint applied to an unsealed knot soon deteriorates, as shown in the panel at the left. The painted portion at the right shows no indication of the sealed knot that is underneath. The paint film that covers the knot will last as long as that which covers the clear portion of the wood

New High Voltage Cable, Plastic Sheathed

EXTENSIVE installations are under way in New York, Florida and Wisconsin on new high-voltage (up to 138 kv) with a new high voltage gas or oil pressure cable known as compression cable systems. Instead of the conventional lead sheathing, the cable is protected by a metal reinforced Bakelite polyethylene sheath.

The new cable is light in weight, impermeable to moisture and is chemically inert in contact with delicate high voltage insulation. It is flexible and resists fatigue on the flexing to which a cable sheath is subjected.

This new high compression cable is designed by the Habirshaw Div. of Phelps Dodge Copper Products Corp. Copper skid wires are attached to the outer periphery of the cable to reduce pulling friction and it has been shown that 2000 to 3000 ft of cable could be pulled through the conduits, resulting in fewer splices and fewer man-hole constructions.

Sheathed cable installed in the steel

What do you want in a pump shaft?

Strength?
Resistance to corrosion? Hardness? Stiffness?

When you specify *Monel* for pump shafts, you get the combination of qualities needed to combat severe service conditions of wear, stress, vibration, corrosion, and heat. *Monel* insures against frequent, costly replacements; cuts maintenance overhead.

Remember... *Monel* has *all* these features:

- **High resistance to corrosion, corrosion-fatigue, and stress-accelerated corrosion.**
- **Exceptional hardness, which means less wear at bearings and journals.**
- **High resistance to fatigue caused by stress, vibration, and pulsation.**
- **Strength equal to that of steel.**
- **And if you need special properties, there is *"R" Monel* for high-speed production machining; *"K" Monel* that is heat-treatable to tensile strength higher than 150,000 psi; *"KR" Monel* that is both free-machining and heat-treatable.**

For help in solving metal selection problems, send for your INCO NICKEL ALLOYS SELECTOR. This handy slide-rule-type chart tells you at a glance which of the versatile Inco Nickel Alloys will best serve your requirements.

THE INTERNATIONAL NICKEL COMPANY, INC.
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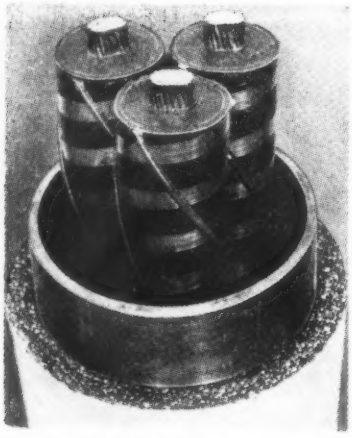
MONEL
solved these difficult problems—

Case 1. In a large metropolitan power plant, the mild steel shaft of a huge circulating pump failed repeatedly because of corrosion-fatigue. Several other metals were tried without success. Then engineers called for "K" Monel. *The result was the world's largest high Nickel alloy pump shaft*—13'x9" dia.!

Case 2. A pump manufacturer had difficulty making long, thin shafts for multi-stage high pressure pumps. Stresses set up during machining caused the shafts to deform and fail in service. Heat-treatable *"K" Monel* was tried—and proved to be the solution to this problem, too.

EMBLEM OF SERVICE
NICKEL INCO ALLOYS MONEL* • "K"* MONEL • "S"* MONEL • "R"* MONEL • "KR"* MONEL • INCONEL* • NICKEL • "L"* NICKEL • "Z"* NICKEL
*Reg. U.S. Pat. Off.



Cross-section of the high compression cable showing three oval cross-section conductors with oil-paper insulation. Surrounding the insulation is a reinforced Bakelite sheath. The spiral skid wires reduce pulling friction. It is said that the lighter weight attained by the use of this cable permits 2000-3000 ft of cable to be readily pulled through a conduit

pipe is surrounded by gas or oil at 200 lb per square inch pressure. The cable is said to be capable of carrying four times its normal working voltages and to fully satisfy the need for a cable whose life should be 30 to 50 yr at a minimum. *From the January 1948 issue of Bakelite Review, a publication of the Bakelite Corporation, New York, N. Y.*

Cold Room Construction

AS AN AID in experimental research on petroleum fuels, the U. S. Petroleum Experiment Station at Bartlesville, Oklahoma, recently constructed a new low-temperature room. Light hydro-carbon materials may be stored, blended and tested without appreciable vapor loss. Normally maintained between 35 and 40 F the new laboratory can be operated at any temperature down to 0 deg F, and in a test run the room was reduced to 112 F below zero.

Insulation on walls, floors and ceilings of the new laboratory consist of a combination of Foamglas and corkboard. A half inch wainscoting of asphalt plank extends 4 ft up the walls from the floor to protect the insulation from bumps by hand trucks and oil drums. The roof is designed to serve as an explosion hatch, which will give away first in case of explosion of vapors in the blending room. *From the April 1948 issue of Armstrong's Insulator, a publication of the Armstrong Cork Co., Lancaster, Pa.*

Trained Watchmen —an Industrial Must

A PRECARIOUS practice followed by many industrial plants today is to take an otherwise unemployable worker and assign him to the post of watchman. If he is no longer capable of operating a machine, driving a truck or handling other normal duties, management considers him a likely prospect for the job.

If the man is physically or mentally unfit, there is every chance he will fail in an emergency with the resultant loss or incapacitation of the plant.

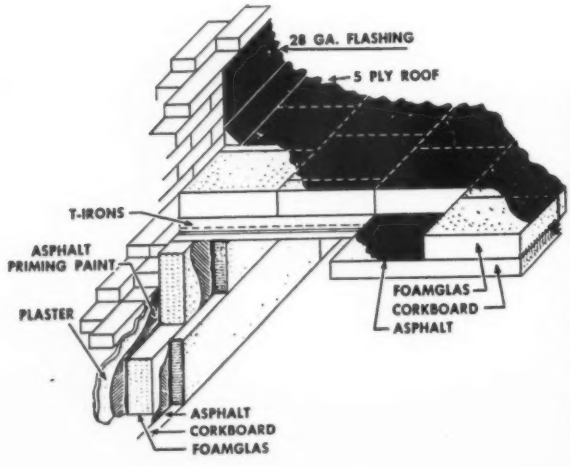
Such watchmen may be conscientious and make their rounds of inspection in a mechanical way, but the amount of real protection furnished is very small. This was proved emphatically by the famous government case during the war when officials sent inspectors into a strategic plant during the night without the knowledge of the watchmen. These inspectors spent several hours within the plant and made drawings of important features and left without being detected.

Another example of the inefficiency of untrained watchmen was demonstrated at the beginning of the last war by the $15,000,000 Firestone Rubber and Latex Corp. fire at Fall River, Mass. This fire completely destroyed one-tenth of America's crude rubber supply. About 15 minutes after the fire was discovered, the watchman, apparently on the assumption that it was time to shut the water off, closed the two 8-in. valves which controlled the sprinklers in the burning building. This proved to be the fatal error from which all the destruction followed. He then told two pipers, who were on duty, that he had shut off the water and everything was all right; but they, immediately recognizing the seriousness of what he had done, leaped out of the shop window, ran through the yard and reopened the valves. It is estimated that the sprinklers were shut off for ten or fifteen minutes. Irrespective of excuses, the basic fault was the lack of proper training to guard a valuable plant.

The alert, intelligent and responsible watchman is an important factor in the discovery of fires in their incipiency, so that prompt measures can be taken to minimize danger. Records reveal that failure of watchmen to perform their duties account for approximately ten per cent of industrial fires during an average year.

In a recently conducted study of watchman failure as related to fires, it was revealed that 41.1 per cent of the failures were due to the watchman's negligence to notify the fire department promptly at the outbreak of the fire; 34.3 per cent of the failures were due to watchman delinquency; 21.8 per cent were due to the improper use of existing fire protection equipment; and 2.8 per cent were caused by poor planning of the watchman's route.

Only 37 of the 178 plants had some form of supervision of their watchmen. Only 9 had central station supervisory service; most of them relied upon watchclocks. The awakening to error does not come, unfortunately, until a serious fire or theft occurs.— *From the Central Manufacturing District Magazine, a publication of the Central Manufacturing District, Chicago.*



Sectional drawing showing the construction details of the new laboratory. Floors, walls and ceiling are insulated with foamglas and corkboard set in asphalt. The floor has a 4-in. concrete wearing surface and the walls are protected by wainscoting extending 4 ft from the floor and consisting of 0.5 in. thick asphalt plank

Plate Buggies Speed Tank Construction

BY USING "plate buggies" that were fabricated in its own shop, The Crown Tank Co., Bronx, N. Y., is saving time and reducing costs in construction of a number of syrup storage tanks. These buggies were specially built for tank-erecting jobs where space does not permit the use of a crane; however, they have proved to be such time savers that they are now being used in great numbers.

The buggies consist of two wheels so placed and grooved that they ride the top edge of a steel plate. The wheels are held by plate formed into a deep U that curves around the plate that the wheels ride. This U has a small wheel on each end to keep it centered and to reduce friction. On the inside of the buggy there is a small step that holds the plate to be

positioned. On the outside of the buggy there is an upright arm that holds the plate erect for welding.

One advantage of the buggies is that a simple gin pole may be erected to raise the plates to the proper height. The first shell strake is welded to the bottom or floor of the tank and then the second shell strake is hoisted plate by plate to the buggies and rolled by hand to their proper place.

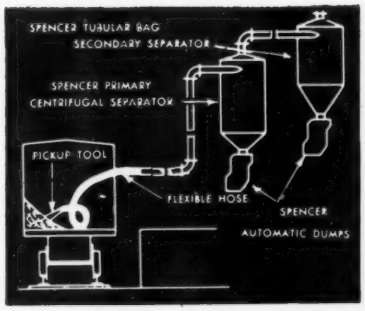
For example, the first plate of the second strake is lifted by means of a gin pole and hoisting engine to the

These plate buggies saved many man-hours of labor in the construction of this 250,000 gal syrup tank

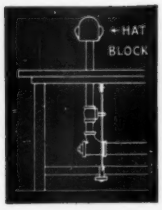
buggies which are set atop the first strake. The plate is then unfastened from the tackle and rolled on the buggies to the opposite side where it is tack welded into place. Then the second plate is hoisted onto the buggies and rolled around so that it butts the first plate that has been welded into place. The buggy nearest the first plate is rolled slightly back toward the center of the second plate. This allows the second plate to fall into position for tack welding to the first plate. Then one buggy is removed from beneath the plate and the other buggy is moved clear to the far end. This allows the plate to drop into position for tack welding the bottom of the plate. The plate is then butt welded to adjoining plates and buggies are returned to the position below gin pole to receive another plate.—*From Hobart Arc Welding News, a publication of The Hobart Brothers Co., Troy, Ohio.*

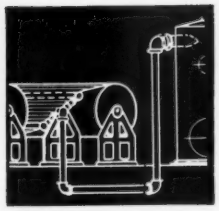
Subfloor Ventilation to Prevent Frost Heavage

FROST BUILDUP beneath floor slabs complicates construction of freezer rooms on, or partially below, grade. Frost buildup beneath floor slabs is slow and methodical. Over long periods of operation, freezer rooms draw heat from the ground through the floor slab faster than the ground heat



Lint is removed from finished hats and liner cloth, hats are cleaned, and freight cars are loaded, unloaded, and cleaned.





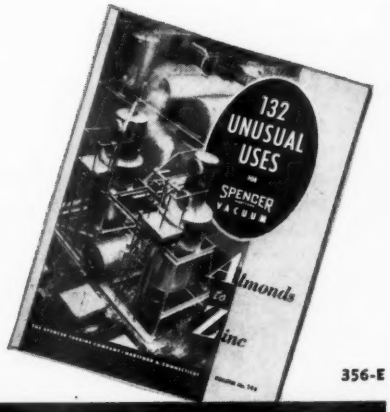
Freight Cars, Hats and Textiles

...WITH SPENCER VACUUM

Vacuum, the new tool for industry is handling raw materials by the ton, performing dozens of operations automatically on the production line, and removing lint, dust, and other materials, just before packing and shipping.

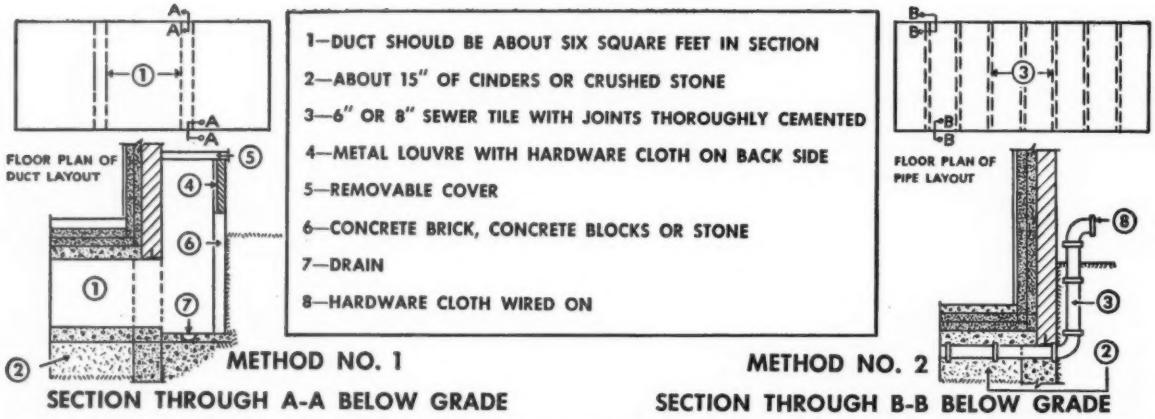
A few of the unusual applications are illustrated above, but the real progress comes when plant engineers understand the fundamental functions of vacuum and apply them to their specific manufacturing problems.

For instance, excess powdered sugar is removed from candy on a conveyor line. Almonds are set into the tops of cakes, bags are deflated, valuable metals reclaimed, and moisture removed from wet cloth—all with Spencer Vacuum and all explained in the new Spencer Bulletin—yours for the asking.



356-E

SPENCER VACUUM CLEANING
HARTFORD
THE SPENCER TURBINE COMPANY, HARTFORD 6, CONN.


1—DUCT SHOULD BE ABOUT SIX SQUARE FEET IN SECTION
2—ABOUT 15" OF CINDERS OR CRUSHED STONE
3—6" OR 8" SEWER TILE WITH JOINTS THOROUGHLY CEMENTED
4—METAL LOUVRE WITH HARDWARE CLOTH ON BACK SIDE
5—REMOVABLE COVER
6—CONCRETE BRICK, CONCRETE BLOCKS OR STONE
7—DRAIN
8—HARDWARE CLOTH WIRED ON
FLOOR PLAN OF DUCT LAYOUT
FLOOR PLAN OF PIPE LAYOUT
METHOD NO. 1
METHOD NO. 2
SECTION THROUGH A-A BELOW GRADE
SECTION THROUGH B-B BELOW GRADE

Two methods of construction which may be used for subfloor ventilation to prevent frost damage. Under normal conditions the maximum dimensions of unventilated floors should not exceed 20 by 20 ft

can be restored by natural forces. This ground frost works gradually from the center of the room out toward the wall foundations. It builds up from year to year and eventually exerts sufficient force to buckle and crack the floor and walls.

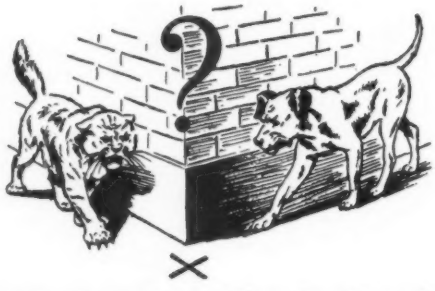
Solutions of this problem have generally consisted of such methods as suspended floor slabs or the introduction of artificial heat beneath the slab by means of electric coils or a grid of warm pipes.

A more practical solution has recently been set forth in the simple set of construction specifications worked out by engineers of The Armstrong Cork Co. These are shown briefly in the accompanying drawings.

Frost action may be prevented by ventilating the soil underneath the freezer room floors with a system of air ducts constructed as shown by the drawings. They should be spaced at regular intervals so as to introduce sufficient warm air to keep the ground temperatures above the freezing point.

Ducts can be constructed either as concrete tunnels or of terra cotta sewer tile. Both types should be laid across the short dimension of the floor to allow for maximum circulation of air. The ends of the pipes or tunnels should be covered with screen wire to prevent the entry of animals, insects, leaves, gravel and other rubbish.

There are two rules of thumb used in roughly estimating the construction of the ventilating ducts: 6 or 8 in. pipes should be laid on corresponding 6 or 8 ft centers; 6 ft square tunnels should be constructed on approximately 16 ft centers.



Will X Really Mark the Spot?

Every neighborhood has its tough dog and un-timid cat, the bosses of their respective balliwicks. Everyone interested in cat and dog feuds have secretly wished to see such a meeting between the respective champs as pictured above. The outcome of such a meeting, or, better known as fracas, would be interesting and would probably be comical if not too serious. It might be classed as a supreme tangle or measure of foot-work and ability.

Ability usually is the outgrowth of experience. Thirty-two years in the manufacture of pump valves has given us such experience to serve you in your needs for better pump valves and check valves.

FREE. Write for latest descriptive bulletin. It includes practical tips for improving pump performance.

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Test quickly motors, fixtures and appliances for open circuits . . . Trace circuits in signal or communication systems . . . Detect "grounds."

For CONTINUITY testing on bench or at the job simply plug into any outlet . . . no batteries needed . . . Your vest pocket Star Universal Tester serves as your bench tester all over the plant.

For POWER testing one end of the test cord is plugged directly into the sprocket of the tester . . . The five foot leads test 110-600 volts accurately . . . The No-Leak test lamp eliminates a-c "false glows," gives positive results.

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Mfrs. of Star Renewable Fuses & Star Test Pliers

Soil composition, drainage, climatic locale, and floor dimensions all have a bearing on the problem. The maximum dimensions of unventilated floors should, under normal conditions, not exceed 20 by 20 feet. Under these conditions, natural heat from the sun and earth will penetrate the ground underneath the freezer to a distance of about ten feet from the outside wall.—*From the April 1948 issue of Armstrong's Insulator, a publication of The Armstrong Cork Co., Lancaster, Pa.*

Detecting Refrigerant Leaks

DETECTION of leaks in the refrigerating system has always been important to refrigerating engineers. This is particularly true in commercial and industrial equipment, which contains relatively small amounts of refrigerant sealed in and expected to last the lifetime of the equipment. Even a small leak over a long period will make the system inoperative.

Leak detection methods now used for refrigerating systems are:

1. Soap Bubble Test. Leaks are detected by applying soap solution to the outside of the piping. Leaks are observed because the escaping gas causes soap bubbles to form at the point of leakage. This is an elementary but useful method for testing a system when first assembled, using air pressure as a testing medium.

2. Sound Effect. Large leaks can be easily detected in a quiet place by the hiss of escaping gas. Inward leaks or air leaking into a vacuum can also be detected under similar conditions. Special electronic pickups are sometimes used to give increased accuracy.

3. Chemical Swabs. Ammonia leaks are frequently detected by this method, using a sulfur taper to react with the gas to form fumes. Leaks in sulfur dioxide systems are detected with a swab carrying saturated ammonia water. White fumes form in the vicinity of the leak.

4. Halide Torch. This is a device for finding escaping refrigerant by reaction with copper in a flame. A green color is produced if refrigerant is present. The source of the refrigerant leak is located by the exploring suction tube of the halide torch which conducts the sample into the flame. The halide torch is a very sensitive method and has gained wide acceptance in the refrigerating industry. The main objection is the use of an open flame which makes it dangerous with inflammable types of refrigerants. It can be used only with halide refrigerants.

5. Color Tracer Method. Dye stuffs are added to the refrigerant through the oil circulating system. The composition of one widely used color concentrate consists of a red soluble dye of 1 per cent in 99 per cent of a medium viscosity oil. A soluble dispersion of color concentrate is obtained which mixes with the balance of the oil in the refrigerating system.

A dosage of 4 oz in a system containing 8 lb of refrigerant and perhaps 2 pints of oil, that is, a typical 1 hp condensing unit, gives a color distribution of about 0.1 per cent in the oil. The refrigerant picks up the color from the oil through the operating cycle of the machine. The dye deposited at the point of leakage is easily detected.

When refrigerating equipment is assembled, either in the field or factory, some or all of these tests are used. When the assembly is complete the equipment is pressure tested and large leaks are detected and remedied. High vacuum is then usually applied and the failure to hold the vacuum is cause for further testing and elimination of the leak. The refrigerant is then charged and after a runin period a halide torch is frequently used.

This, however, is sometimes not effective in detecting very small leaks, intermittent leaks, or leaks which develop after a period of operation. The color tracer method of leak protection has advantages in connection with leaks of this character. *D. H. Crampton and Carl Winnefeld, Highside Chemicals Co., in the March 1948 issue of Refrigerating Engineering, a publication of the American Society of Refrigeration Engineers.*

That could be simplified with

SUPER-SILVERTOP

Even a simple installation such as that above, dripping a main, can be simplified, to your profit, with a Super-Silvertop inverted bucket Steam Trap. Notice the saving in fittings, think of the difference in installation time. Even if you included a strainer in the change-over, the new simpler job would use less fittings and cost no more.

You get *important* savings with Super-Silvertops in a trap that has *no* cored passages, one that can be used either as an elbow or straight-in-line, a trap that is years ahead in engineering advantages even after imitation has set in.

Let us tell you more about the details and advantages of Super-Silvertop Traps—write for a copy of "How To Choose A Steam Trap," a helpful book no matter whose steam traps you buy. It is sent free on request.

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OFFERS A LINE OF DEPENDABLE CONTROLS FOR VARIOUS INDUSTRIAL REQUIREMENTS

THE ONLY 100% MERCURY SWITCH EQUIPPED CONTROLS. THEY ASSURE ACCURACY, BETTER PERFORMANCE AND LONGER CONTROL LIFE.

Wherever the control of temperature, pressure, liquid level or mechanical operations are involved, Mercoid Controls and Switches assure a maximum in efficient and dependable performance.

PRESSURE CONTROLS
Available for numerous industrial applications. They are equipped with Bourdon tubes and have outside double adjustments which eliminate guesswork when setting controls. Indicators show the operating range on the calibrated dial.

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For control of liquids or gases, such as air, oil, water, paraffin, glue or distillate vapors and many other industrial applications. A heavy gauge Bourdon tube is employed which is actuated by the expansion of volatile liquid within the remote bulb. The control is equipped with convenient outside double adjustments.

LEVER ARM AND FLOAT CONTROLS
Mercoid lever arm controls have a variety of applications where it is desired to mechanically open and close electric circuits Mercoid float controls are used for maintaining fluid levels in tanks or for control of sump pumps or cellar drainers.

LINE VOLTAGE THERMOSTAT
The No. 855 thermostat is used for line voltage applications where it is desired to handle the full motor load directly without the use of a relay. Available with "on-off" manual switch for unit heater applications. These thermostats are used for both heating and refrigeration applications.

TRANSFORMER-RELAYS
Type V is a reliable low voltage mercury contact relay which also acts as a transformer inducing low voltage (24 volts) on the pilot circuit. There is no hum or chatter. Used for all types of automatic equipment. Available in various voltages, cycles and circuits.

MERCURY SWITCHES
Mercoid brand switches are noted for their superior operating qualities. Various types available.

MERCOID CONTROLS are available in a variety of types for sensitive control of Pressure, Temperature and Lever actuation.

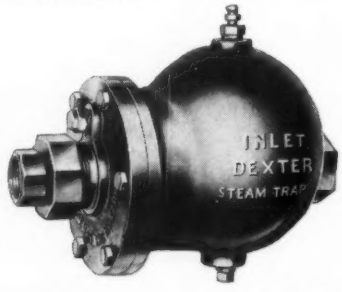
Write for further information.

THE MERCOID CORPORATION
4201 BELMONT AVE. ★ ★ CHICAGO, ILL.

New Products and Methods

(Continued from page 12)

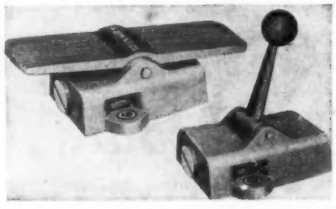
steel and all parts, including the air vent which is located on the outside of the body, are readily accessible for checking, cleaning and repairs. Internal working parts are bronze, with stainless steel valve and seat. Any necessary replacements of valve and seat can be made without removing trap from the line, or dismantling the unit. Float is of seamless, high-pressure construction.



Trap operates without time lag so that condensate is removed at a speed equal to, or faster, than it collects. A special feature is the quick-operating gage that checks the inside water seal, and provides a means of determining trap tightness. The traps are available in seven sizes. The Leavitt Machine Co.

Hand and Foot Valves

29 These valves are of compact design especially adaptable for the positive, accurate control of small single-acting and double-acting cylinders on continuous-operated machines. Either Hand and Foot Valve is available



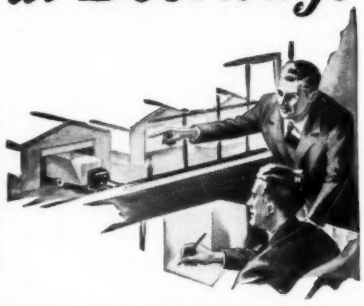
in ¼ in. size. Both valves, Model HF-3 (3-Way), and Model HF-4 (4-Way) have the same precision-machined internal parts and are designed for locking or non-locking with neutral. Airmatic Valve, Inc.

Electronic Volt Ohmmeter

30 The Model 214 is a compact, self-contained, battery operated electronic volt-ohmmeter that eliminates the need for plugging into an ac line. This new instrument is the successor to the older 20,000 and 25,000 ohms per volt testers. It is suited for applications requiring resistance measurements and voltage measurements at high impedance—15 million ohms constant impedance. It is ideal for making tests in the field and at the installation. For resistance and voltage tests, plant amplifiers and PA system units need not be renewed and hauled to the shop. Built for self-checking of its own battery condition at any time and usable for 1350 complete cycles of 4 min. Operates on each set of batteries.

No warm up period, meter protected from burn-outs, and it has an easy to read scale with quick, positive, internal pivot action. Power supply required: 2 size C flashlight unit cells; 1 standard miniature type 45 volt battery. Tube complement: One 1S5. Dimensions, 8¼ by 6 by 4¼ in. Weight, 5¼ lb. Hickok Electrical Instrument Co.

STOP Efficiency Loss at Doorways



● **Plant efficiency often bogs down at doorways without letting you know it. Costs pile up while vehicles wait for doors to be opened. Time and labor is lost when busy employees open or close doors. Heating and air-conditioning costs soar when doors aren't closed promptly.**

You can put a quick stop to these profit leaks by installing Kinnear Motor Operated Rolling Doors.* With a touch of a button, you raise or lower these doors at a second's notice—from any number of convenient points. They open straight upward and coil compactly above the lintel; all floor and wall space is *fully usable* at all times. The opened doors stay overhead, safe from damage by wind or vehicles. Their rugged, all-steel construction assures longer wear, lower maintenance, extra protection against fire, theft, and storm damage.

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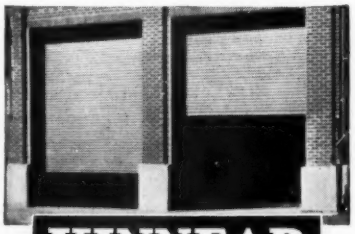

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Plant Engineer's Library

How to Get Along With People

Improved Foremanship by Auren Uris. Copyright 1948; size 5½ by 8 in.; 280 pp; cloth bound. Published by The Macmillan Co. Price $3.50.

Probably no other single factor is as important to an individual as his ability to co-operate and work harmoniously with other individuals. While this book deals primarily with the training of better foremen and supervisors, it is in fact a manual for every individual who must get along with his fellow workers, those working under him and those over him.

The information is developed through conversations between a young foreman and other members of his organization. These conversations bring out essential factors in human relations, plant organization and the relation of production, cost and quality control, and the maintenance department.

The author, who is now Editor of the Supervisory Training Program of the Research Institute of America, has a wide industrial experience as a worker and as a manager, with five years' experience as a foreman in one of the largest plastic plants in the country. A knowledge of what makes a successful supervisor is therefore drawn from first-hand knowledge. It is told in down to earth, understandable terms, with the trials and tribulations of the young foreman skillfully woven in so that it reads like a novel.

Job Analysis and Evaluation

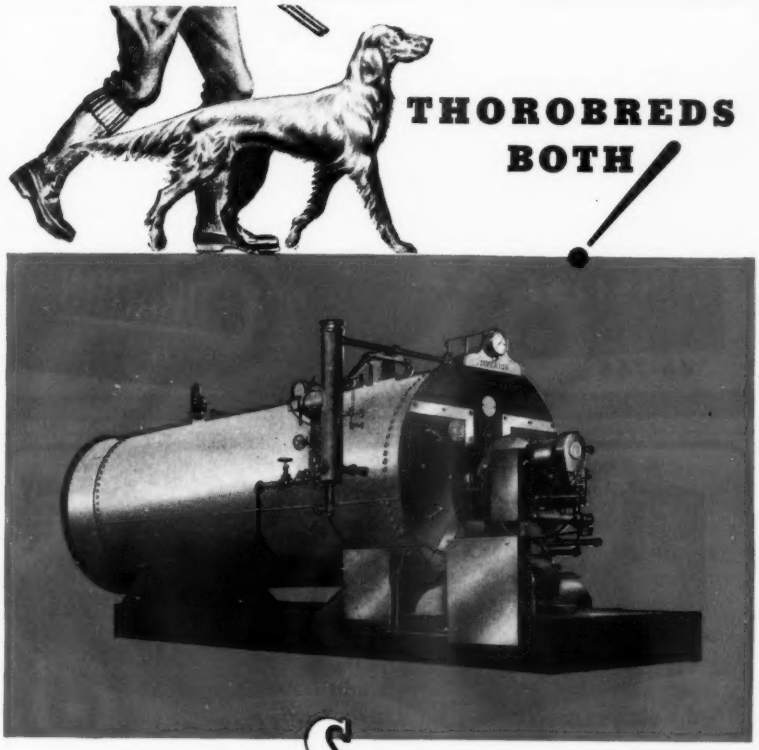
Practical Job Evaluation by Philip W. Jones. Copyright 1948; size 5½ by 8½ in.; 226 pp. plus four appendices and index. Published by John Wiley & Sons, Inc. Price $4.00.

A manual of the plans and techniques successfully used in business and industry, discussing the practical aspects of job evaluation and the design, installation and salesmanship of the procedures necessary to determine the wages of employees. The book is divided into 14 chapters. It starts with the history and nature of job evaluation, carries through the practical application and through selling the idea to the employees, to the unions and to management.

There are many ways of setting up and administering a job evaluation program, most of which will work if based upon fairness and reason. It cannot, however, be isolated from the living organism of industry and business so that there is no plan which has achieved universal acceptance. The choice must rest upon and be influenced by conditions peculiar to each organization.

Techniques discussed have proven successful in many situations and the book is in effect an operating manual based upon common sense and practical experience. Appendix A is the Job Evaluation Manual of the Department of Labor Conciliation Service; Appendix B is a guide to job evaluation from the Department of Labor, Division of Labor Standards; Appendix C is a sample job evaluation manual from the Sperry Gyroscope Co.; and Appendix D covers representative clauses from labor agreements concerning job evaluation made from the author's study of more than 300 labor contracts.

Any book advertised or reviewed in this issue may be purchased from the Book Department PLANT ENGINEERING, 53 W. Jackson Blvd., Chicago 4, Ill. Only books published in the United States for delivery in this country are available from the Book Department



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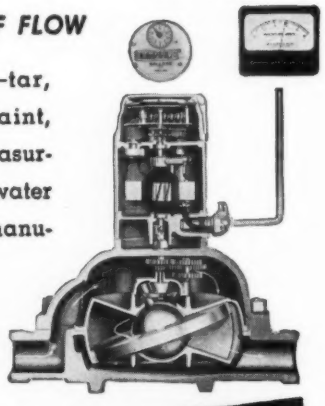

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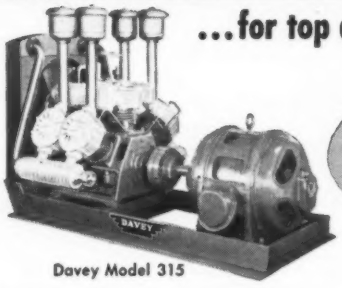

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IN LINE with today's trend toward employment of small departmental compressors instead of one large centralized machine, Davey offers a complete line of industrial units.

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DAVEY

P&P-102

DAVEY COMPRESSOR CO. *Dealers in Principal Cities*

Manual of Instruments

Electric Instruments Manual. Size 8½ by 11 in.; illustrated; 156 pp. including a glossary of terms. Published by General Electric Co., Schenectady, N. Y. Price $1.00.

This manual is an excellent reference work on the construction and operating principles of electric instruments. The book is logically divided into seven sections: 1. Permanent-magnet moving coil instruments; 2. Rectifier and thermocouple instruments; 3. Moving-iron instruments, ammeters and voltmeters; 4. Electrodynamometer instruments; 5. Power factor motors, sychroscopes and frequency meters; 6. Recording instruments; and 7. Specialized instruments.

The detailed drawings aid in no small measure the aim of the compilers to present a manual devoid of cabalistic symbols and formulas. Basic principles are first outlined and the complete description of specific instruments and their operation developed from this point.

Materials Handling Techniques

Some Basic Techniques in Materials Handling. Size 8½ by 11 in.; 84 pp.; illustrated; paper bound. Published by Clapp & Poliak, Inc., 350 Fifth Ave., New York City. Price $1.00.

This book is a collection of the papers presented at the technical sessions of the Conference on Materials Handling held in Cleveland last January. Nineteen papers are included in the collection and many of them are illustrated. Subjects covered range from warehousing, palleti systems and elevators to standardization of materials handling equipment and planned packaging.

Mineral Composition and Properties

Chambers Mineralogical Dictionary. Copyright 1948; 5½ by 8 in.; 48 pp.; cloth bound. Published by Chemical Publishing Co., Inc. Price $4.75.

This dictionary lists the chemical composition, crystal form, physical and chemical property, occurrences and uses for over 1400 minerals and mineralogical terms. It is beautifully illustrated with 40 colored plates which will help the reader recognize the different minerals. Geologists, mineralogists, metallurgists, jewelers, and chemists, as well as those who use minerals or materials of mineralogical origin will find this volume very useful.

Bulletins . . . Catalogs

BUILDING MAINTENANCE

101 **Steel Deck Gratings**—Form 44 is a 24 page bulletin depicting the products of this firm in the many applications to which it may be applied. Discussion of construction, safety factor, type of finish, and specifications are given. Anchors for the grating are also described with photos and drawings to show application. A safe load table is given. Wm. F Klemp Co.

102 **Interior Wire Barriers**—This is a catalog sheet depicting the construction and possible utilization of the woven wire barriers made by this firm for use inside the plant. Standard Wire & Steel Works.

103 **Isolating Vibration**—Bulletin Vc-500, 4 pages, is a handy bulletin showing the way in which vibration may be isolated by the use of cork. Depicted in 14 different drawings are the applications to which it may be applied. Listed are the proper loadings for different densities of cork. Korfund Co., Inc.

104 **Cleaning by Vacuum**—Bulletin No. 144, 20 pages, is a running story of the many uses which vacuum cleaning finds in industry. An important point often overlooked is the possible use of a vacuum system for reclaiming valuable materials. Spencer Turbine Co.

105 **Electric Water Cooler Service Manual**—Included in this manual is a parts list with prices. The manual section contains helpful information that may be used in the installation and maintenance of these coolers. Tables, charts schematic drawings, and photos of parts make up the illustrations. Ebco Mfg Co.

106 **Floor and Deck Gratings**—This 16 page bulletin presents the safety gratings made by this firm. The various important points of construction are shown with sketches and photos. Applications in various industries are shown Standard sizes, safe loads, and specifications for sizes are given Dominion Bridge Co., Ltd.

107 **Roof Cooling Sprays**—A 6 page fold out bulletin depicting the construction and application of the rotary roof coolers made by this firm. Performance diagram sketches, and approximate cost per sq ft for operation are given Siegfried Ruppright.

108 **Steam Detergent Cleaning**—Form 7238, 8 pages, explains where and how to use this type of cleaning and also the use of the solution and steam gun for paint stripping. The bulletin explains the different solutions and their use. Installation of fittings on plant steam lines is shown. Data sheet gives information on the solution-lifting steam gun. Oakite Products, Inc.

109 **Glass Building Insulation**—This 16 page bulletin describes the glass insulation products made by this company and many drawings are used to show it is incorporated into the walls and roof. The use of the glass product for insulating processing equipment is also dwelt on. Pittsburgh Corning Corp.

110 **Fabric for Roofs, Insulation**—This 8 page folder describes the waterproofing membrane fabric made with a base of glass. Application photos depict the use of this fabric when impregnated with mastic, for roofing, pipe insulation, and other uses. Lexington Supply Co.

111 **Anti-Condensation Tape**—Form B-28, is a catalog sheet which describes and illustrates the use of a pliable cork pipe covering to prevent condensation drip from cold pipes. J. W. Mortell Co.

VALVES, TRAPS, REGULATORS

112 **Non-Condensible Gas Purger**—Installation photos, cut away drawings, tables, charts, and hookup diagrams illustrate the text of this 8 page bulletin, No. 173-A, on non-condensible gas purgers. Armstrong Machine Works.

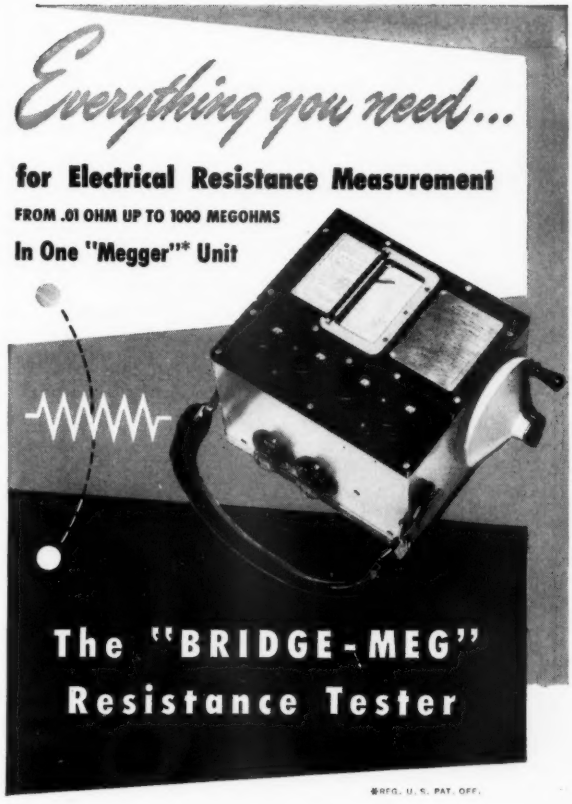
113 **Forged Steel 600 lb Valves**—Catalog 48FS, 16 pages, describes and illustrates this line of valves with line drawings, tables of working pressures, and cutaway drawings. List prices and dimensions are given. Valves include: Gate valves, outside screw and yoke, union or bolted bonnet: Globe and angle valves, inside or outside screw with either bonnet; Check valves, union or bolted cap. Ohio Injector Co.

114 **Steam and Water Mixer**—A catalog sheet, No. 900, describes the construction and operation of the Type SWV steam and water mixer made by this firm. Cutaway drawings illustrate construction and installation is shown in sketches. Capacities, dimensions and list prices of spare parts are given. Sarco Co., Inc.

115 **Ball Type Valves**—Bulletin V4-10M, 4 pages, illustrates with cutaway and equipment drawings the construction of this ball type valve in sizes from ½ to 2 in. Special features of materials and control are described. Dimensions for each size are given. Rockwood Sprinkler Co.

116 **Pump and Check Valves**—This is a 4 page bulletin on the pump, hydraulic, and silent check valves made by this firm. The valves are illustrated. Working pressures, styles, assemblies, and special features are given. Combination Pump Valve Co.

Mark the numbers of the bulletins you wish to receive on the no obligation, no postage card between Pages 10 and 11 and 42 and 43



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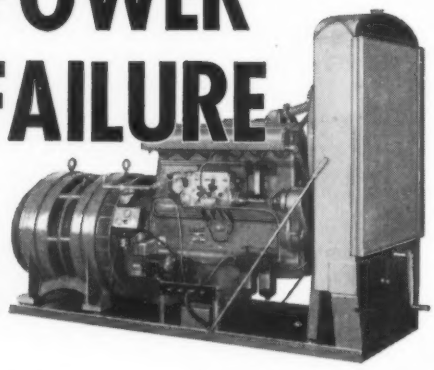

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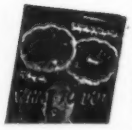


117 **Temperature Limiting Regulator**—This 4 page bulletin, No. 8531, explains and describes the construction, operation and applications suitable for this snap action temperature regulator. Specifications, range, and dimensions are given. Manning, Maxwell & Moore, Inc.

118 **Industrial Thermostatic Steam Traps**—Bulletin No. 1047, 12 pages, is really a catalog containing descriptions, lists of applications, prices, and capacities. Drawings illustrate typical applications and recommended piping diagrams. A selection table for choosing the proper size trap considering capacity factors. W. H. Nicholson & Co.

GASKETS, PACKING

119 **Application of Leather Packings**—A helpful book of 52 pages that explains how mechanical leather packings are designed and how they should be selected for application. Photos, cutaway drawings, and dimensional drawings are used to increase understanding. Tables are given for each type. American Leather Belting Association.

120 **Chemically Inert Gaskets**—Four pages make up this bulletin on gaskets suitable for use around solvents and acids. The construction of 9 different types is illustrated with drawings to explain the various applications. United States Gasket Co.

PIPE AND COUPLINGS

121 **Soldered Flexible Hose Coupling**—This is a catalog sheet describing with text, cutaway drawings, and sketches, the use and applications to which this quick soldered coupling may be applied and how it is done. Brockway Co.

122 **Air and Liquid Couplings**—A 30 page general catalog of the products of this company. Illustrated with drawings and equipment photos of the various types of quick couplings for air and liquids. Specification tables, and dimensional drawings are given to aid selection of proper coupling for application. E. B. Wiggins Oil Tool Co., Inc.

123 **Stainless Steel Pipe and Tubes**—Bulletin No. 3 of 24 pages describes the stainless steel pipe and tubes of this firm and the many uses for them in industry. Recommended procedures are given for shaping, forming, welding and handling. Dimensions, weights, and capacities are given. National Tube Co.

PUMPS

124 **Controlled Volume Pumps**—A 28 page Catalog No. 146 with supplemental order sheets. The construction and operation of these controlled volume chemical and high pressure pumps is shown with cutaway drawings, application photos, and combinations to show the special features. Capacity-pressure selection tables are included to aid in selection of pumps as are tabulations of materials for use in handling different liquids. Milton Roy Co.

125 **Close Coupled Centrifugal Pumps**—Bulletin 710, 12 pages, is a catalog on the close coupled single stage type enclosed impeller centrifugal pumps made by this firm. Materials of construction, specifications, and performance curves for various sizes are given. Table of dimensions for respective sizes also given. Goulds Pumps, Inc.

126 **Practical Pumping Problems**—This 18 page bulletin presents the possibilities for lengthening pump life with firm's product. Text and application photos show how the use of different metals suitable for handling various liquids help. Stories are presented for reciprocating, centrifugal, deep-well, and rotary pumps. Two pages tell how to select a metal for pumping a corrosive. International Nickel Co., Inc.

TOOLS

127 **Hand Power Hools**—This 36 page bulletin on the full line of equipment made by this firm illustrates, describes, and explains such equipment as: Chain saws, electric hand planers, circular saws, electric hand drills, flexible shaft grinders, buffer, and sanders, and many attachments for these tools to make them more versatile. Mall Tool Co.

128 **Rope Knowledge for Riggers**—This is a pocket size bulletin for men who have to handle rope and tackle. The 48 pages are replete with information illustrated with drawings to show how to handle rope, tie many knots, rig tackle, definitions of blocks and tackle and rules and hints for safe lifting. Columbian Rope Co.

129 **Wire Rope Selection**—This 120 page book has for its purpose the dissemination of information useful in selecting, buying, and using wire rope. Another function is to establish factual standards. The various types of construction and materials in wire rope are discussed. Tables and charts with equations for application are provided. Spooling and reeling, splicing, socketing, fittings and attachments, and assemblies are discussed. Really a worthwhile book. Wire Rope Institute.

130 **Adjustable Pipe Threader**—Form 77 explains how these power driven pipe threaders operate and how they can also cut, bevel, and groove. Photos show the actual use of the machine and the highlights of its construction. Specifications, recommended accessories and tools, and price lists for all are given. Beaver Pipe Tools, Inc.

131 **Pressure Handle for Drills**—This 4 page bulletin explains how the pressure handle works in relieving the worker of the strain of pushing. Photos show various applications and how the handle is applied to nearly any drill. Price is given. Pressure Handle Co.

132 **Keyway Broaches**—A 12 page bulletin illustrating and describing the keyway broaching tools made by this firm. Dimensions and stock sizes available are listed. Prices listed. du Mont Corp.

MECHANICAL POWER TRANSMISSION

133 **Motorless Speed Reducers**—Price list 10-27, 32 pages, lists the speed reducers made by this firm. Specifications, ranges, and capacities are listed in addition to dimensions, weights, and prices. Janette Mfg. Co.

134 **Stock Chain Silent Drives**—This 32 page catalog is devoted to description, explanation, and illustration of the silent chain stock drives made by this firm. Instruction photos for mounting are given as are tables and charts for use in selection of drives to suit the purpose. Maintenance care is described. Morse Chain Co.

Mark the numbers of the bulletins you wish to receive on the no obligation, no postage card between Pages 10 and 11 and 42 and 43

135 **Differential Speed Reducer** — This 4 page bulletin describes and illustrates with drawings and photos the manner in which the reducer is constructed and the important points for users. An exploded drawing shows the order of assembly and each part. The 6 sizes available are shown with pertinent data. Winfield H. Smith Corp.

136 **Automatic Centrifugal Clutch**—This 4 page bulletin is really an introduction for the reader to a firm which formerly made these clutches and industrial trucks and is now returning to the field. Salsbury Corp.

137 **Variable Speed Sheaves**—Four page Form No. 47-810 explains the construction and operation and possible applications in industry of this variable speed sheave. Application photos show the uses to which it may be put. DoAll Co.

ALARMS AND SIGNALS

138 **Fire Alarm Protection**—This is an 8 page bulletin on the fire alarm systems, boxes, signals, printing recorders, and punch registers made by this firm. All are illustrated and explained and modifications possible noted. Autocall Co.

139 **Whistles and Signals**—Bulletin 466, 12 pages, describes the design and operation of the whistles and signals and their controls that are made by this company. Installation and maintenance of these call devices are discussed separately and in step-by-step procedure. Selection of the device is dealt with by use of tables and charts. Leslie Co.

HEATING AND VENTILATING

140 **Refractory Coating**—A catalog sheet that describes the product of this firm suitable for applying to refractory walls that is available in 3 ranges up to 3000 F. Methods of application are given and the results that may be expected listed. RX Chemical Co.

141 **Deaerating Feedwater Heaters**—Bulletin N-16, 8 pages, describes and illustrates a new spray-tray heater. Pointed out specifically is the fact that unit has no vent condenser. Sketches and line drawings illustrate the text. Elliott Co.

142 **Steam Accessories**—Bulletin 100 is a 4 page fold out sheet that depicts a complete high pressure power plant in several colors and shows where the many steam accessories made by this firm fit into the scheme of producing and utilizing high pressure steam. Schutte & Koerting Co.

143 **Flexible Exhaust Tubing**—This is a 6 page folder that shows with illustrations, tables and charts the applications to which this tubing may be applied. Tube is suitable for air, gases, powdered or granular materials, or exhausting other light solids. Flexible Tubing Corp.

144 **Self-Contained Fire Tube Boiler**—Bulletin EC-64, an 8 page folder explains and illustrates the way various methods of firing the boiler may be done. Features of construction and flow charts are shown. C. H. Dutton Co.

145 **Fan Dust Collecting Systems**—This is a 32 page bulletin that depicts how the products made by this firm are used in many different industries to collect and recover dust and other abrasive materials. The book is replete with photos of actual applications. Some of the type of fittings, fans, and blowers used are shown and explained. Kirk & Blum Mfg. Co.

ELECTRICAL

146 **Dry Type Load Center Transformers**—A 20 page bulletin describing the dry type Class B insulated load center transformers for plant power distribution. Available in 3 phase, 60 cycle, 100 to 2000 kva with high voltages from 2400 to 14,400 and low voltages from 600 to 240 or 208Y/120. Wagner Electric Corp.

147 **Building Wires, Cables, and Cords**—This 42 page bulletin contains detailed information on building wires, cables, cable assemblies, and portable cords. Complete specifications are shown and pertinent code tables are included. Application and construction photos are used for illustration in addition to equipment photos. Appliance and Merchandise Dept., General Electric Co.

148 **Electronic Voltage Regulators**—This 20 page catalog describes electronic control of voltages and currents and outlines the claimed advantages in providing adjustable output voltage, more precise regulation accuracies, good wave form, fast recovery time, and insensitivity to line frequency fluctuations. Sorensen & Co., Inc.

149 **Electrical Splicing Tape**—Bulletin No. 25, 8 pages, lists the properties, applications and methods of use for pressure sensitive electrical tapes employing the brand resins of this firm. Charts, sketches, and application photos illustrate points. Bakelite Corp.

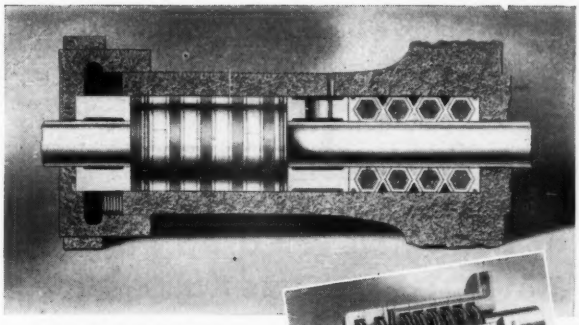
150 **4 in 1 Megohmer**—Bulletin No. 441, 4 pages, describes and illustrates the instrument that is an insulation tester, an ohmmeter, an a c voltmeter, and a d c voltmeter. Instructions for use in application are given as are the specifications. Herman H. Sticht Co., Inc.

151 **Multi-Circuit Unit Substations**—This 16 page bulletin, No. 11B6935, describes construction details of three transformer types, oil-filled, liquid-filled, and dry type. Featured are highlights of the load ratio equipment and the metal-clad switchgear. Allis-Chalmers Mfg. Co.

152 **Emergency Power**—Bulletin 4-1, 14 pages, is given to showing with photos and text the many applications to which emergency power generating units may be put. D. W. Onan & Sons, Inc.

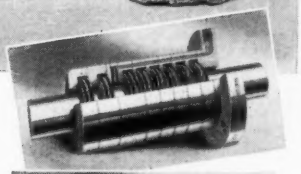
153 **Renewable Electrical Fuses**—A catalog sheet describing 250 and 600 v fuses available in ferrule, knife, and plug types. Specifications, dimensions, and prices for capacities are given as is an explanation of construction. Star Fuse Co., Inc.

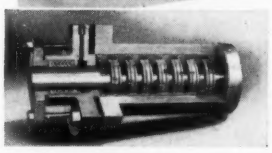
154 **Electrical Relay Guide**—This guide is made up of 4 pages and deals with 24 different relays made by this firm. A full page indexed table lists all the specifications and dimensions plus additional features worthy of noting Allied Control Co.



Above: GARLOCK 800 Varitemp Ammonia Packing

Right: GARLOCK 875 Gas Compressor Metal Packing





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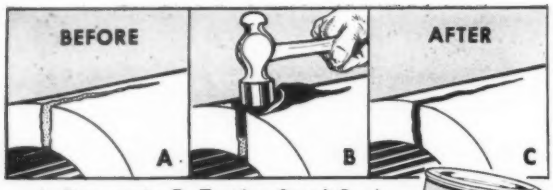

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INSTRUMENTS AND CONTROLS

155 **Automatic Combustion Control**—This 4 page bulletin explains how and why use of the device described can save money on fuel oil burning installations. Line drawings and installation photos give method of application. Reasons are presented why device saves oil. General Power Plant Corp.

156 **Combustion Safeguard**—Bulletin F1-1, 12 pages, contains illustrations, wiring diagrams, and descriptions of combustion safeguard systems. Construction drawings show important points. Wheelco Instruments Co.

157 **Electrical Counters**—Bulletin ES-91, 16 pages, describes the devices, both mechanical and photoelectric cell types, that are used. Many different applications are shown in industry. Sketches and drawings explain the amount of action and clearances necessary for operation. Prices are given. Production Instrument Co.

158 **Instrument Transformers**—This buyer's guide of 80 pages supplies pertinent information and data, including prices, on all standard types of current transformers, potential transformers, and metering outfits, that conform to ASA insulation standards. Dimensions are not given but will be furnished on request. General Electric Co.

159 **Instrument News**—Vol. 4, No. 1 of this news bulletin contains information on resistance measuring instruments, resonant-reed frequency meters and rheostats, tachometers and several other lines of laboratory instruments and equipment. Photographs illustrate several instruments. Various applications are discussed. James G. Biddle Co.

160 **Industrial Instruments**—This catalog, No. L, is the general catalog for this maker of a wide variety of instruments. It is profusely illustrated with line drawings, application photos, equipment photos, charts, tables, and complete specification lists for all the equipment made. Prices are given. General Radio Co.

161 **Selenium Rectifiers**—This is a catalog sheet presenting basic rectifiers of 250 to 2000 amp, self contained rectifiers of 250 to 1500 amp, Stepless variable controls of 250 to 5000 amp, tap switch controls of 250 to 4000 amp, and combination rectifiers of 250 to 2000 amp. Richardson-Allen Corp.

162 **Electrical Test Instruments**—This 54 page catalog, tab indexed, contains price lists and descriptive application stories in addition to instructions for use of the instruments. All the specifications are given as well as capacities. Associated Research, Inc.

SURFACE AND LIQUID TREATMENTS

163 **Fuel Oil Conditioning**—A 7 page bulletin discusses the five main problems encountered in the burning of industrial fuel oil. Text, table and illustration all strive to explain the importance of several points in the treatment of fuel oil. E. F. Drew & Co., Inc.

164 **Rubber Base Masonry Coating**—Bulletin No. 684, 4 pages, is an explanation of how the products of this firm may be used for industrial plant maintenance of walls. Truscon Laboratories

165 **Protective Paints**—This 28 page pocket booklet describes and explains the specifications and possible applications of the line of paints made by this company. These include oil base, bituminous base, aluminum base and varnishes. Quigley Co., Inc.

166 **Rust Preventative**—A 36 page catalog, Form 246, contains instructions, cautions, and advice on application of the rust preventative made by this company. Specifications of each product are also given with most likely applications. Masonry and floor paint and finishes are also given in this manner. Rust-Oleum Corp.

167 **Protective Coating**—This 4 page bulletin illustrates and highlights the advantages claimed for this acid proof coating and shows applications in various industries. Listed are some of the acids that it will resist. Methods of application are given. Prufcoat Laboratories, Inc.

168 **Oil Absorbent**—A 6 page folder describing the operations necessary for the production of this compound that is used to reduce accidents in plants having oil or grease on floors. Safety and Maintenance Co.

69L **Pressure Leak Sealers**—This 4 page folder describes and illustrates the applications and methods used for the two products recommended by this firm for sealing masonry or concrete walls retaining liquids. Engineering service is also offered. Sika Chemical Corp.

170 **Protective Coating**—This 4-page bulletin, MC-1, explains the product of this company that is an organic coating material formulated from synthetic resins. Application photos show the many types of equipment to which it may be applied. Available in some colors. United Chromium, Inc.

171 **Cleaning Solvents**—This bulletin, No. 1995, contains information on flash points, boiling ranges, chemical constitution, toxicity, trade names, on those solvents most frequently used for cleaning. It helps selection of a solvent for a particular job. DuBois Co.

MATERIALS HANDLING

172 **Spiral Conveyor**—Catalog No. 803, 48 pages, is a complete catalog listing all the spiral conveyor equipment made by this firm. Application photos, drawings, dimensions, weights, capacities, type of conveyor, and factor for hp required for drive are given. Parts that make up the complete conveyor are broken down for separate ordering. Prices are stated. Jeffrey Mfg. Co.

173 **Material Bucket Loaders**—Bulletin 5M, 4 pages, show these loaders in actual work scenes handling various materials. Specifications are given. The unit can drive itself around the yard. N. P. Nelson Iron Works, Inc.

174 **One Man 2 Wheeled Trucks**—Bulletin No. 48, 6 pages, describes and explains with text and illustrations the various application such as handling barrels, drums,

kegs, carboys, rolls of wire, or tool pans that these two wheeled trucks may be used for. Capacities and sizes are given. Sabin Machine Co.

175 **Palletless Lift Truck**—A 6 page fold out sheet that illustrates with many equipment and application photos the uses to which this attachment for the company's lift trucks may be applied. An explanation of what it is, what it does, and how, plus the specifications, is given. Hyster Co.

176 **Materials Handling Catalog**—Catalog No. 23 of 86 pages contains illustrations of each type of equipment with installation photos to show applications. Book is divided into 5 sections as: Power fork truck, power jacklift, stacker and crane, hand lift truck, and the floor truck with skid platform and storage rack division. Also given is specially built equipment. Lewis-Shepard Products, Inc.

177 **Wire Rope Electric Hoist**—A 4 page bulletin describing the low-capacity hoist made by this firm. Photos and dimension drawings are given as are the descriptive specifications. Yale & Towne Mfg. Co.

178 **1000-Lb Fork Truck**—This 4-page Bulletin 1303 shows how this truck can be used in factories and warehouses where floor loading capacity is restricted and aisles narrow. Complete dimensions are given. A table lists load weight in relation to load length. The various controls are explained and the electrical and mechanical details are described. Baker-Raulang Co.

179 **Overhead Handling Equipment**—This 56 page Bulletin, C-1, is this firm's presentation of their line of overhead materials handling equipment. Large number of application photos and numerous sketches show use and construction of electric hoists, cab cranes. American Monorail Co.

180 **Rubber Flight Enclosed Conveyors**—Catalog No. 4748, 39 pages, describing with drawings all the various applications to which these rubber flight, sealed pin, conveyors can be put. These drawings appear to be taken from actual installation plans and could furnish ideas for further applications. Hapman Conveyors, Inc.

181 **Magnetic Separator**—Bulletin 801 contains factual information on how to remove tramp iron non-electrically from heavy loose flowing materials. The general use of the product, its magnetic strength, construction and advantages are also given. Illustrations show typical installations. Eriez Mfg. Co.

182 **Single Stroke Hand Lift Truck**—Bulletin 211, 2 pages, explains the important points in construction and operation of this lift truck. Complete specifications are given. Capacity of truck is 2500 lb. Lyon-Raymond Corp.

183 **Conveyors and Pneumatic Tubes**—Form No. 243 is an 8 page bulletin on co-ordinated control of plant production through the use of various types of conveyors and pneumatic tubes. Profusely illustrated with application photos chosen to carry out this theme and show how control can be had. Lamson Corp.

184 **Electric Industrial Trucks**—A 16 page bulletin, No. 12, presents the story for the industrial electric truck. Various points are brought up to show how this type of truck fits into the industrial materials handling picture. Electric Industrial Truck Association.

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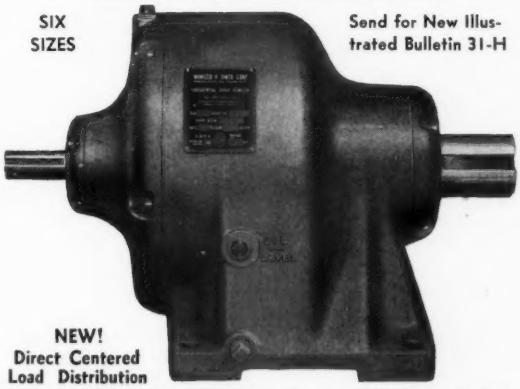

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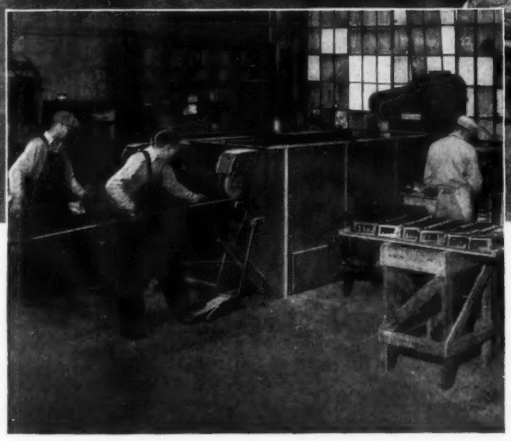

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